FEDORENKO, N.P.; BRAGINSKIY, O.B.; FRIDMAN, L.A.; SHCHUKIN, Ye.P.

Economic effectiveness of the pyrolysis of low-octane gasolines. (MIRA 17:9)
Khim. prom. no.5:339-344 My '64.

AL'MAN, P.A.; FEDORENKO, N.P.

Specialization of tire plants. Kauch. i rez. 23 no.5:45-50 My '64.
(MIRA 17:9)

1. Gosudarstvennyy institut po proyektirovaniyu predpriyatiy rezinovoy promyshlennosti.

FEDORENKO, N.P., akademik; SUKACHEV, V.N., akademik; KARAKEYEV, K.K.; FRANK, G.M.; KONSTANTINOV, B.P., akademik; ASTAUROV, B.L.; YEFIMOV, A.N.; SHUMILOVSKIY, N.N.; ISHLINSKIY, A.Yu., akademik; GERASIMOV, I.P., akademik; KAZARNOVSKIY, I.A.; BYKHOVSKIY, B.Ye., akademik; ZHEBRAK, A.R., akademik

Discussion of the annual report. Vest.AN SSSR 35 no.3:95-112 Mr '65. (MIRA 18:4)

1. Prezident AN Kirgizskoy SSR (for Karakeyev). 2. Chleny-korrespondenty AN SSSR (for Frank, Astaurov, Yefimov, Kazarnovskiy). 3. AN Kirgizskoy SSR (for Shumilovskiy). 4. AN BSSR (for Zhebrak).

KOCHEROV, N.P.; FEDORENKO, N.P.; MARKOSOVA, N.M.

Economics of the production of impact resistant polystyrene plastics.
Plast. massy no.4:1-4 '65. (MIRA 18:6)

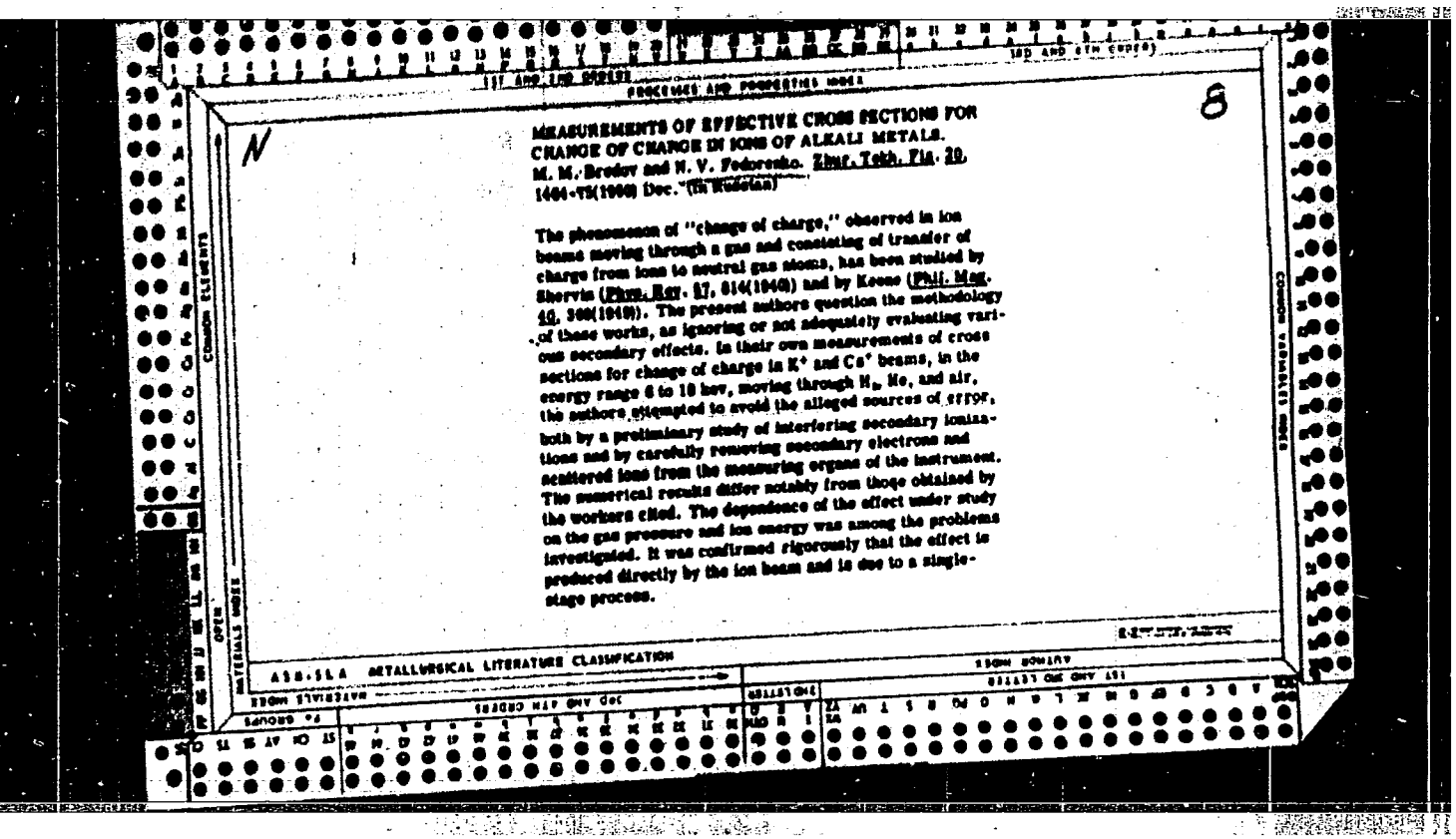
FEDORENKO, N.P.; LIPKINA, S.G.

Economics of the production of sulfuric acid from sulfur-containing waste gases. Khim. prom. 41 no.8:597-599 Ag '65.
(MIRA 18:9)

KOLESANOV, F.F.; SHUMAKOV, N.S.; FEDORENKO, N.V.; SHUMAKOV, L.G.; GIMMEL'FARB, A.I.

Dressing of Akkermanovka ores and sintering of the concentrates produced. [Sbor. trud.] Nauch.-issl. inst.met. no.4:44-53 '61. (MIRA 15:11)

1. Nauchno-issledovatel'skiy institut metallurgii (for Kolesanov, Shumakov, Fedorenko). 2. Orsko-Khalilovskiy metallurgicheskiy kombinat (for Shumakov, Gimmel'farb).
(Akkermanovka region—Iron ores)
(Ore dressing) (Sintering)



MEASUREMENTS OF EFFECTIVE CROSS SECTIONS FOR CHANGE OF CHARGE IN IONS OF ALKALI METALS.
M. M. Brodov and N. V. Fedorenko. Zhur. Tekh. Fiz. 29, 1484-95(1959) Dec. (in Russian)

The phenomenon of "change of charge," observed in ion beams moving through a gas and consisting of transfer of charge from ions to neutral gas atoms, has been studied by Shervin (Phys. Rev. 57, 814(1940)) and by Keene (Phil. Mag. 40, 369(1949)). The present authors question the methodology of these works, as ignoring or not adequately evaluating various secondary effects. In their own measurements of cross sections for change of charge in K^+ and Cs^+ beams, in the energy range 6 to 18 kev, moving through H_2, He, and air, the authors attempted to avoid the alleged sources of error, both by a preliminary study of interfering secondary ionizations and by carefully removing secondary electrons and scattered ions from the measuring organs of the instrument. The numerical results differ notably from those obtained by the workers cited. The dependence of the effect under study on the gas pressure and ion energy was among the problems investigated. It was confirmed rigorously that the effect is produced directly by the ion beam and is due to a single-stage process.

Fedorenko, N. V.

Loss of energy by positive ions during a single scattering in gas at small angles. N. V. Fedorenko. *Zhur. Tekh. Fiz.* 24, 1042-9(1954).—The relative loss of energy $\Delta T/T_0$ for colliding particles scattered at a small angle θ is measured in a previously described double mass spectrometer installation (cf. *C.A.* 49, 10047c). ΔT is measured by increasing the accelerating potential at the entrance of the mass analyzer

In all cases ΔT increases with θ. Exptl. values of $\Delta T/T_0$, as a function of θ (0-8°), are shown for I^+ in Ne and 10 k.e.v. A^+ in He, Ne, A, and Kr and compared to values calcd. theoretically. As the values do not agree well in mixt. A^+-A and A^+-Kr it is presumed that collisions in this case are inelastic. The method of electrostatic compensation is applied to scattering with loss of electrons such as $A^+ \rightarrow A^{++}$. In this case there is an addnl. excitation of electron shells of the order of several times 10 e.v. Composition of slow electrons formed in gas on passage of a positive ion beam. *Ibid.* 1050-6.—The double mass spectrometer above is set to a const. angle of 17.5°. The slow ions falling into the mass analyzer are sepd. by a magnetic field. When A is bombarded by 10-k.e.v. A^+ only slow A^+ ions can be detected. If A is replaced by N contg. Kr a small amt. of slow N_2^+ and Kr^{++} and a peak amt. of Kr^+ can be observed. A^+ in N gives a small amt. of N^+ (increasing with 20-k.e.v. A) and mainly N_2^+. If 20- or 40-k.e.v. A^{++} are introduced into Ne, A, Kr, slow Ne^{++}, and Ne^+, A^{++} and A^+, Kr^{++}, and Kr^+ are observed, which are produced by the processes: (1) $I^{++} + G \rightarrow I^{++} + G_{el} + e$ (2) $I^{++} + G \rightarrow I^{++} + G_{el}{}^{++} + 2e$ (3) $I^{++} + G \rightarrow I^+ + G_{el}{}^+$ (4) $I^{++} + G \rightarrow I^+ + G_{el}{}^{++}$. Ionization of gas atoms and exchange of charge of singly charged ions of 5-30 k.e.v. energy. *Ibid.* 2113-23.—A "condensor" method is described to measure in the double mass spectrometer effective cross sections of ionization, charge exchange, and electron loss. An attachment permits measurement of fast ions obtained by charge exchange by measuring the secondary emission of a stainless-steel plate.

(VAS)

N. V. FLAMMID

The cross sections are tabulated for combinations of He^+, Cu^+, He^+, N^+, A^+, Pb^+, Na^+, Ba^+ with H_2, He, Ne, N_2, A, and Kr. The type of reaction is discussed in every case. It is shown that the influence of ionization and electron loss is more pronounced than previously expected. S. P.

FEDORENKO, N. V.

1444 AEC-tr-2351

MAGNETIC ANALYSIS OF A BEAM OF POSITIVE IONS ACCELERATED BY A VOLTAGE OF 5 TO 30 KV AFTER PASSAGE THROUGH A RAREFIED GAS. N. V. Fedorenko. Translated from Zhur. Tekh. Fiz. 24, 769-83(1954). 15p. Available from Associated Technical Services (Trans. 54GGR). East Orange, N. J.

An ion beam monochromatic both in composition and energy was transmitted through a gas and analyzed by a magnetic field. Beams were investigated which initially consisted of atomic ions: singly charged (He^+, N^+, Ne^+, K^+, A^+, Cs^+, I^+, Ba^+, Pb^+, Bi^+), doubly charged (N^{++}, A^{++}, Ba^{++}), triply charged (A^{+++}), and singly charged molecular ions (H_2^+, H_3^+, N_2^+). An examination was made as to which inelastic processes, connected with a change in the e/m of the ions in the beam, take place in single binary collisions between the ions and atoms of helium, neon, argon, krypton and molecules of hydrogen and nitrogen. For singly charged atomic ions the existence has been established of the process of removal of one electron from the ionic shell (ion stripping). The cross section for this process is larger for ions of the heavy elements (for the process $Ba^+ \rightarrow Ba^{++}$ the cross sections sometimes exceed 10^{-14} $cm.^2$). The processes $Ba^+ \rightarrow Ba^{+++}$ and $Ba^{++} \rightarrow Ba^{+++}$ have also been discovered. Electron capture by doubly and triply charged ions was investigated. For the A^{+++} ions the existence of two competing processes has been established: $A^{+++} \rightarrow A^{++}$ and $A^{+++} \rightarrow A^+$. The capture cross sections vary within the limits 1×10^{-16} to 2.5×10^{-15} $cm.^2$ An estimate has been made of the effective dissociation cross sections for the ions H_2^+, H_3^+, N_2^+. (auth)

FEDORENKO, N. V. FD-564

USSR/Physics - Ion scattering

Card 1/1 : Pub. 153 -2/28

Author : Fedorenko, N. V.

Title : Single scattering of positive ions in a gas

Periodical : Zhur. tekh. fiz. 24, 784-796, May 1954

Abstract : Investigates the single scattering of positive ions accelerated by 5 to 30 kilovolts, in hydrogen, helium, neon, nitrogen, argon and krypton for angles, 2.5° to 15°. with a magnetic ion analyzer. Presents data on scattering without charge variation for single-charge atomic ions He^+, N^+, ect. The number of scattered ions quickly falls with increasing angle of declination. For a unique energy in the zone of small angles the heaviers are scattered more strongly. Establishes that the scattering of the molecular ions N_2^+, H_2^+, H_3^+ at angles greater than 2.5° is accompanied by dissociation; the scattering of Ar^{++}, by electron capture. Thanks V. M. Dukel'skiy for his advice and I.P. Skal-skaya for her mathematical computations.

Submitted : February 17, 1954

FEDORENKO, N.V.

USSR/Physical Chemistry - Atom, B-3

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60699

Author: Fedorenko, N. V.

Institution: None

Title: Composition of Slow Ions Formed in a Gas During Passage of a Beam of Positive Ions

Original Periodical: Zh. tekhn. fiziki, 1954, 24, No 11, 1950-1956

Abstract: With a dual mass-spectrometric unit was investigated the composition of slow ions formed in neon, argon, krypton and nitrogen at pressure $2\text{-}3 \cdot 10^{-4}$ Torr. on passage of beams of ions Ar^+, N_2^+ and Ar^{2+}, accelerated by voltage of 10 and 20 kev. On passage of Ar^+ and N_2^+ through Ar, Kr and N_2 are formed, respectively, slow ions Ar^+ and Kr^+, and possible small amounts of Kr^{2+}, N_2^+ and little N^+, the relative amount of N^+ increasing with energy of primary beam, which may be attributed to increased [redacted] section of dissociative ionization N_2. On passage of Ar^{2+} through Ar and

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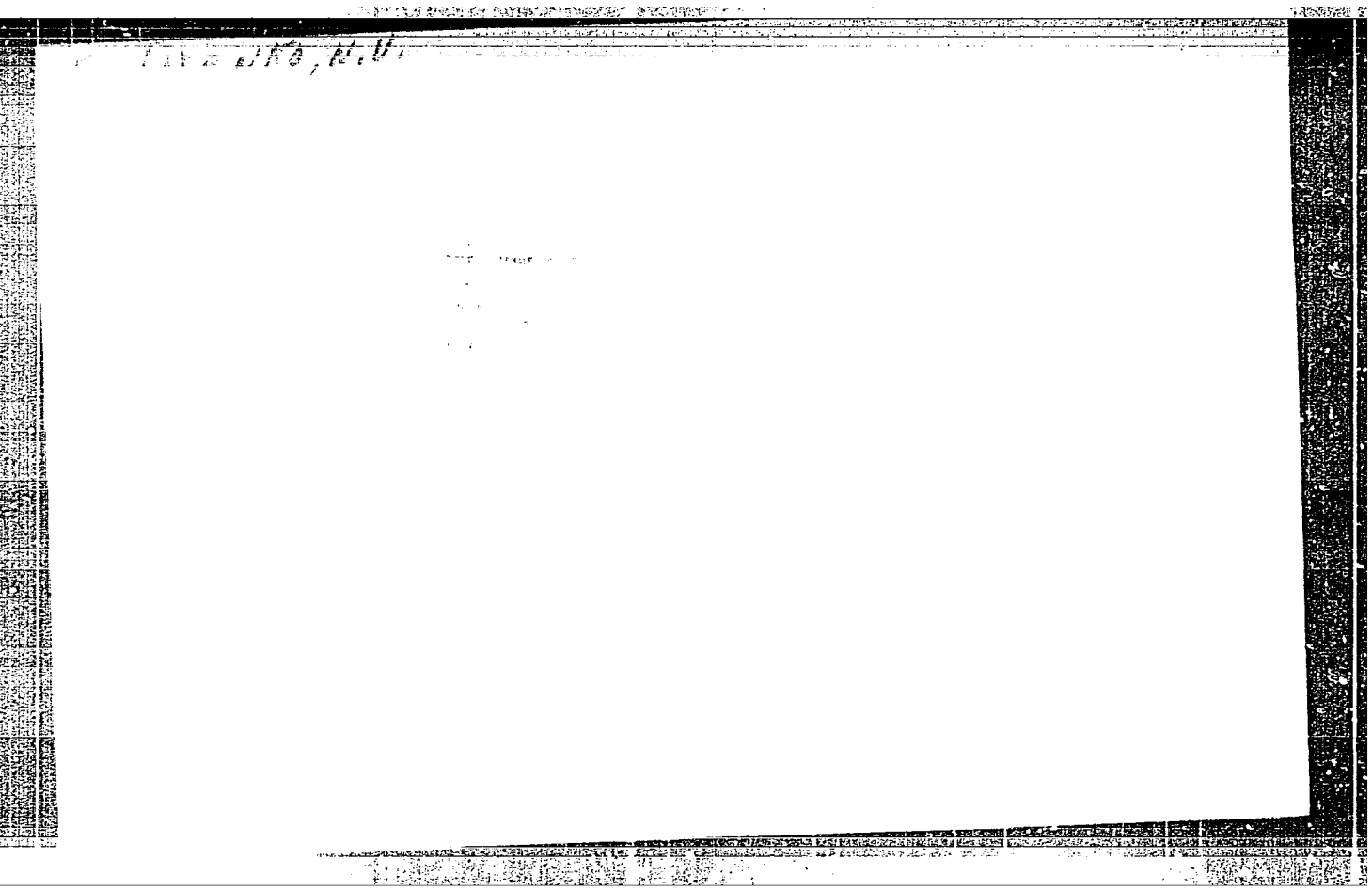
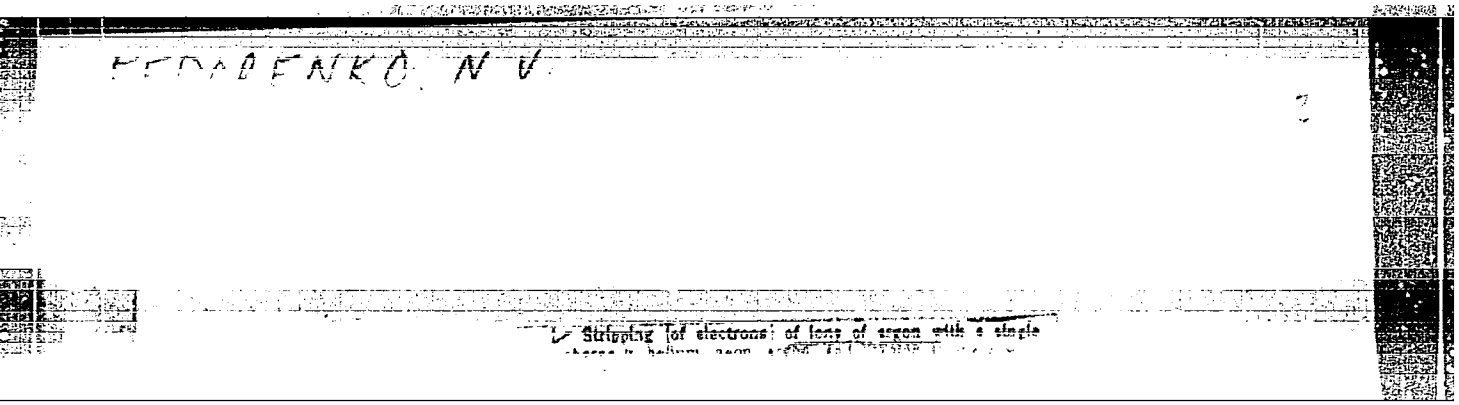
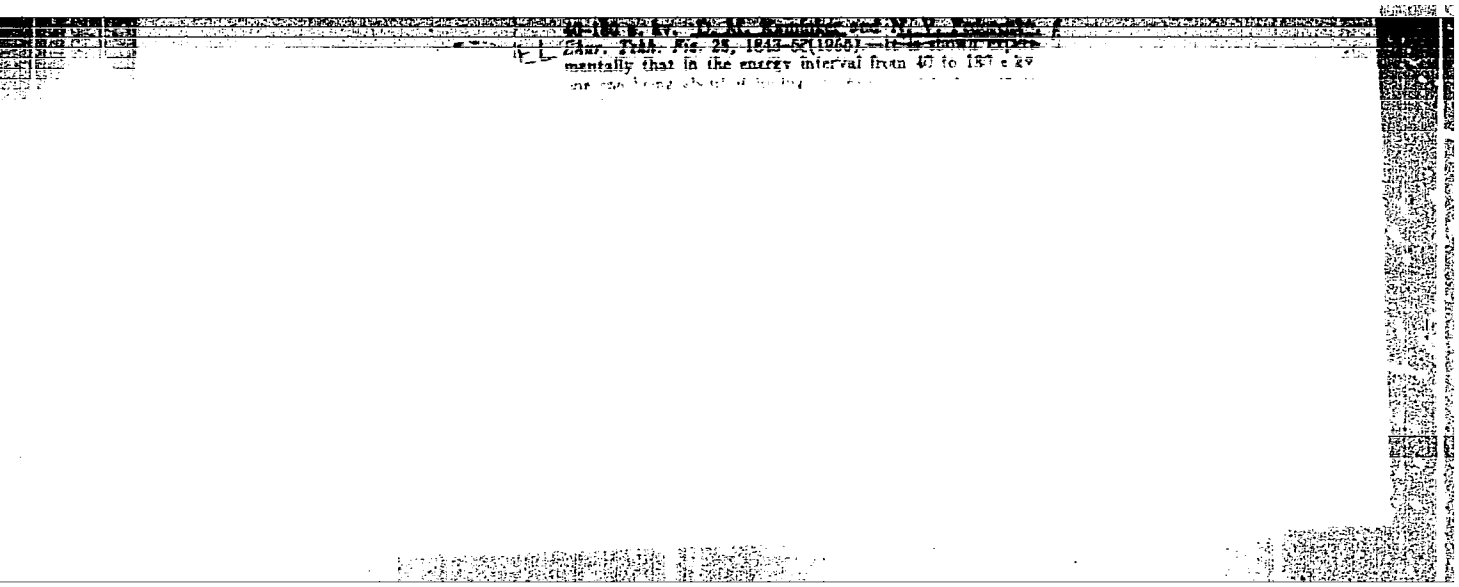
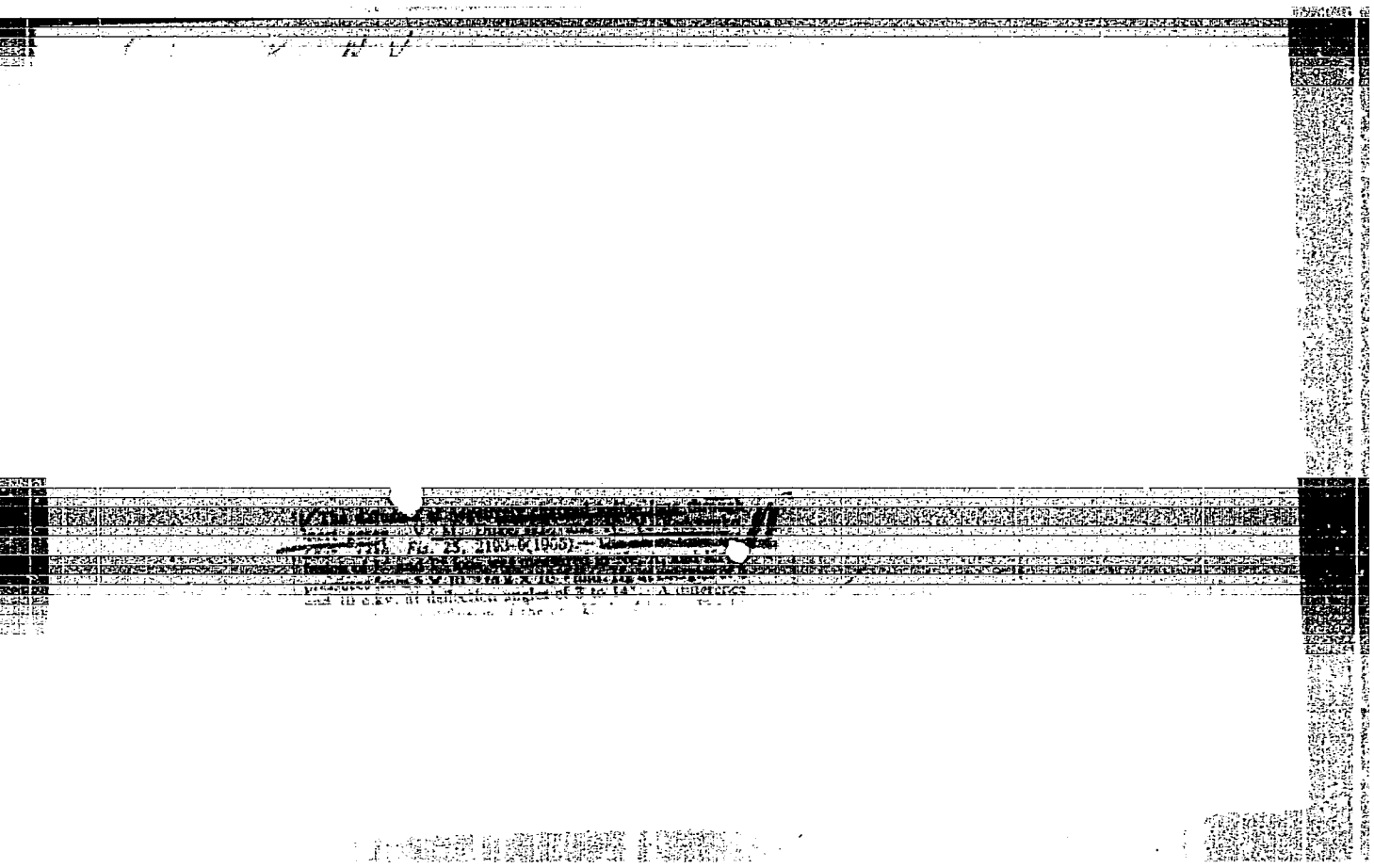






Chem. Phys. 25, 1643–52(1956). It is shown experimentally that in the energy interval from 40 to 187 e kv



FD-3145

USSR/Physics - Scattering of A ions

Card 1/2 FEDORENKO Pub. 153 - 1/26

Author : Kaminker, D. M.; Fedorenko, N. V.

Title : Single scattering of ions of argon during stripping in a gas

Periodical : Zhur. tekh. fiz., 25, No 13 (November), 1955, 2239-2255

Abstract : The primary beam consists of single-charged ions of argon with energy 40 to 150 kev. Under conditions of single collisions of ions A^+ with atoms of argon the authors investigate the angular distribution for: 1) ions A^+ scattered with change of charge, 2) fast ions A^{2+}, A^{3+}, A^{4+}, A^{5+} formed during stripping (i.e. processes $A^+ \rightarrow A^{2+}$, $A^+ \rightarrow A^{3+}$, $A^+ \rightarrow A^{4+}$, $A^+ \rightarrow A^{5+}$), 3) fast neutral atoms arising during resonance overcharge (i.e. $A^+ \rightarrow A^0$). They carry out the measurements in the limits of angles of deviation 0 to 15° from the direction of the primary beam. The authors develop a general method that permits one to calculate the absolute differential cross-section of the process of scattering with change of charge ($d\sigma/dw$) for all angles including $\theta=0^0$. They discover that overcharging and scattering with change of charge are realized mainly for small angles of diviation; at large angles of deviation stripping predominates. On the curves $d\sigma/dw=f(\theta)$ for scattering with stripping there exists a central maximum at $\theta=0^0$, and a second maximum shifted from direction of the primary beam. The angle corresponding to the position of the second maximum increases with increase in order of stripping and with decrease of initial energy

of the ions. On the basis of the curves of angular distribution the authors compute the integral effective cross-sections of the processes of stripping. For initial energy of the ions T=75 kev they find: $\sigma_{1-2} \approx 1.4/10^{16}$, $\sigma_{1-3} \approx 2.5/10^{17}$, $\sigma_{1-4} \leq 6.0/10^{18}$, $\sigma_{1-5} \approx 1.8/10^{18}$ cm^2. The authors also investigate scattering with stripping for the process $A^{+} \rightarrow A^{4+}$ also in helium, neon, and krypton. They thank Professor V. M. Dukel'skiy for his attention, advice, and judgment of the work. Six references: e.g. I. P. Skal'skaya, ibid., 24, 1912, 1954.

Institution :

Submitted : May 27, 1955

FD-2909

USSR/Physics - Ion collisions

Card 1/1 Pub. 146 - 9/19

Author : Dukel'skiy, V. M.; Fedorenko, N. V.

Title : Losses of two electrons by negative ions in collisions with atoms and molecules

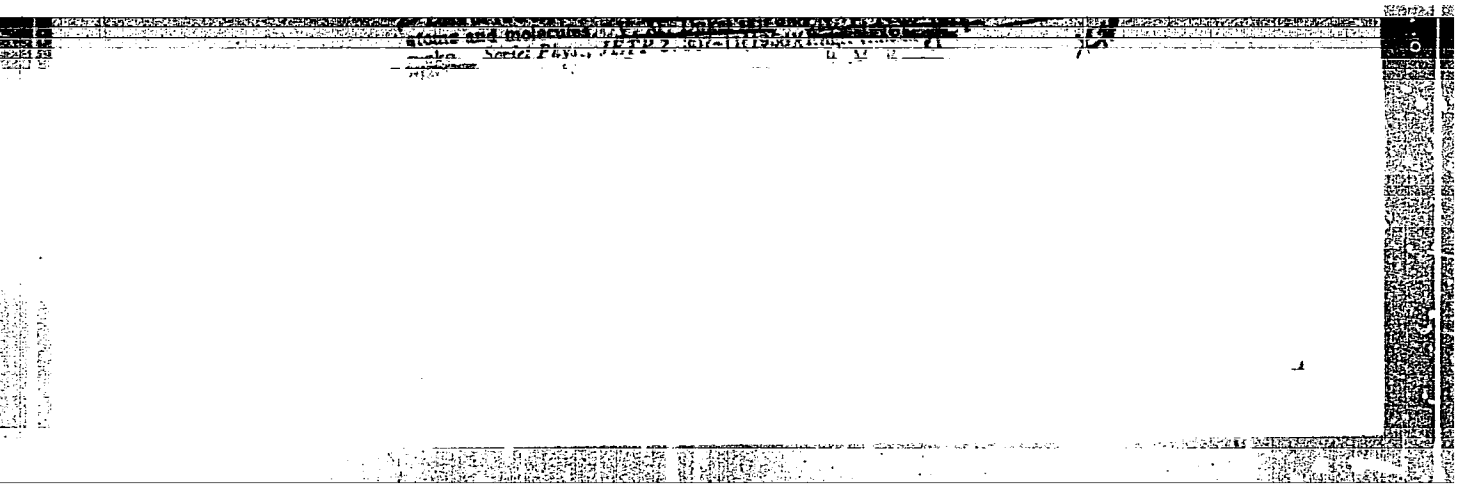
Periodical : Zhur. eksp. i teor fiz., 29, October 1955, 473-478

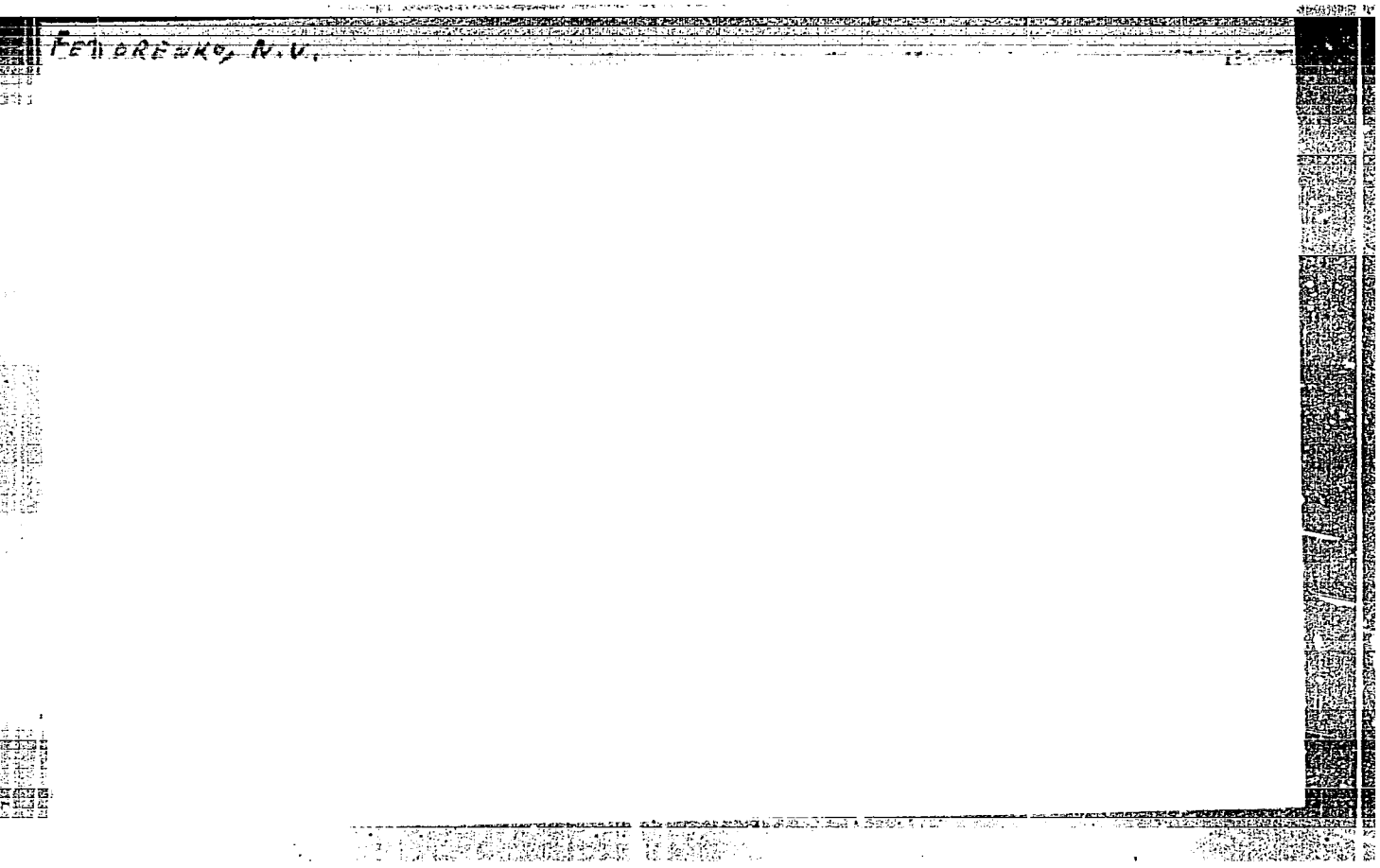
Abstract : In single collisions of the ions Cl^-, Br^-, I^-, Na^-, Sb^-, Bi^-, Sb_2^- (energy 5 to 17.5 kev) with helium and argon atoms, and also with nitrogen and hydrogen molecules, the author observed the appearance of positive ions formed as a result of the loss of two electrons by the negative ions. The effective cross section for this process is of the order of 10^{-17} to 10^{-16} cm^2. For the ions Sb_2^- and Bi_2^- the author observed dissociation with the appearance of not only negative but also positive atomic ions. Three references: e.g. V. M. Dukel'skiy and E. Ya. Zandberg, ibid., 21, 1270, 1951; N. V. Fedorenko, ZhTF, 24, 769, 1954.

Institution : Leningrad Physicotechnical Institute, Academy of Sciences of the USSR

Submitted : May 27, 1954

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000412610013-3"





FEDORENKO, N.V.

USSR/Electronics - Gas Discharge and Gas Discharge Instruments H-7

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12343

Author : Fedorenko, N.V., Afrosimov, V.V., Kaminker, D.M.

Inst : Leningrad Physical-Technical Institute, Leningrad.

Title : Capture of Electrons and Ionization Upon Interaction of Single-Charged Positive Ions with Gas Atoms.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1929-1940

Abstract : A measurement was made of the effective cross sections for the capture of electrons by fast ions (σ_0), for the formation of free electrons (σ_-), and for the formation of slow ions (σ_+) in the case of interaction between ions He^+, Ne^+, Ar^+, with atoms of He, Ne, Ar, and Kr. The ions had an energy $T_0 = 3$ -- 180 kev. The experimental accuracy was ± 10%. The dependence $\sigma_0(T_0)$ has maxima for Ar^+—Kr, He^+—Ne, Ar, Kr. For the pairs He^+—He, and Ar -Ar,

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Fedorenho N.V.

USSR/Electronics - Gas Discharge and Gas Discharge Instruments H-7

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12344

Author : Fedorenho, N.V., Agrosimov, V.V.
Inst :
Title : Ionization of Gases by Ions of He^+, Ne^+, and Ar^+ with Formation of Multiple-Charged Ions Upon a Single Interaction.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1941-1954

Abstract : In addition to the setup previously described (Abstract 12343), the work abstracted involves the use of a slow-ion analyzer. From the relative intensity of the lines of the spectrogram, the authors determine the cross sections for the formation of slow multiply-charged ions (σ_{0n}) by interaction of He^+, Ne^+, and Ar^+ with energies $T_0 = 3$ -- 180 kev, with atoms of helium, neon, argon, and crypton gas. The random errors in the measurements amounted to ≈ 12.5%. Plots are given for $\sigma_{0n}(T_0)$ for the following ions: [illegible]

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electron shells. Such a system is called a quasi-molecule.

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FEDORENKO, N. V.

C-6

Category : USSR/Nuclear Physics - Origin of Charged and Neutral Particles through Matter

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 584

Author : Dukel'skiy, V.M., Afrosimov, V.V. and Fedorenko, N.V.
Inst : Leningrad Physical-Technical Institute of the USSR Academy of Sciences
Title : Transformation of Positive Helium Atoms into Negative Ones by Collision with Atoms of Inert Gases

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 4, 792-793

Abstract : It was observed that negative He ions are formed when 15--175 kev He^+ ions pass through a scattering chamber filled with Kr, Ar, or He. The He^- ion yield was 1.4×10^{-12} amp when the chamber was filled with Ar at a pressure of 2.5×10^{-4} mm mercury, the He^+ ion energy being 80 kev and the He^+ current being 3.3×10^{-7} amp. The He^- ion yield varies linearly with pressure, up to 5×10^{-4} mm mercury. This indicates the charge exchange between He^+ and He^- results from a single collision. Depending on the energy of the He^+ ions, the charge exchange cross section has a characteristic maximum near 60-70 kev; the value of this maximum is 1.5, 0.7, and 0.2×10^{-19} cm^2 for Kr, Ar, and Ne

Card : 1/2

C-6

Category : USSR/Nuclear Physics - Origin of Charged and Neutral Particles through Matter

Abs Jour : Ref Zhur - Fiziki, No 1, 1957, No 584

respectively. The cross section for He is on the order of 10^{-21} cm^2. Since the He^- ion in the ground state $(1s^22s)^2s$ is unstable, it is possible that we deal here with a metastable He^- ion in a $(1s2s2p)^4P_{5/2}$ state, the lifetime of which should be on the order of 10^{-3} sec. (The time of flight of the He ions in the instrument was approximately $4x10^{-7}$ sec at an energy of 60 kev).

Card : 2/2

FEDORENKO, N. V., Moscow

"Scattering of Atomic Particles with Change of Charge," a paper submitted at the Third International Conference on Gaseous Electronics, Venice, 11-15 Jun 57.

601665

FEDORENKO, N. V. Moscow

"Cross Section for Ionization and Electron Transfer Occurring in Collisions of Positive Ions in Energy 10-100 kev with inert Gasses Atoms," a paper presented at the Third International Conference on Gaseous Electronics, Venice, 11-15 Jun 57.

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FEDORENKO, N.V.

PSHENITSYN, N.K.; FEDORENKO, N.V.

Salts of N-substituted dithiocarbamic acids and their utilization in the determination of rhodium and iridium. Zhur. neorg. khim. 2 10:2375-2382 O '57. (MIRA 11:3)
(Carbamic acid) (Rhodium) (Iridium)

Fedorenko, N. V.

57-11-18/33

AUTHORS: Afrosimov, V. V., Fedorenko, N. V.

TITLE: Investigation of the Energy of Multi-Charge Ions Formed at the Ionization of Gas Atoms by Positive Ions (Issledovaniye energii mnogozaryadnykh ionov, obrazuyushchikhsya pri ionizatsii atomov gaza polozhitel'nymi ionami).

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 11, pp. 2557-2572 (USSR)

ABSTRACT: The results of measurements of the magnitude of the kinetic energy of secondary argon-ions with a charge of from 1 - 6 at various angles of flight are given. By means of these results the magntude of the whole inelastic energy-loss at the ion-atom collision are classified. The analysis of the experimental data was carried out according to the classical conception on the dispersion of atomic particles. The following was carried out in detail: an Ar^+ or Ne^+ -ion beam with an energy of T_o = 75 keV passed through a chamber filled with argon. The kinetic energy of the secondary ions Ar^+, Ar^{2+}, Ar^{3+}, Ar^{4+}, Ar^{5+}, Ar^{6+}, which were found in consequence of the ionization of the atoms at single collisions, were determined. The secondary ions outgoing in the direction of the primary ion beam under the angles $77^o < \varphi < 90^o$ were investigated. The authors show that the range of critical energies possessed by secondary ions is very wide: secondary ions with kinetic energy of from fractions of to some thousand elect-

Card 1/3

Investigation of theEnergy of Multi-Charge Ions Formed at the Ionization of Gas Atoms by Positive Ions. 57-11-18/33

ron Volt were discovered. At angles of flight of $\varphi < 85^{\circ}$ in a number of cases a clear separation of the secondary ions into two energetic components: a soft and a hard one, were observed. The authors show that the possibility of the existence of both components results from the analysis of the consequencies from the energy-as well as from the momentum conservation theorem. The dependence of the mean kinetic energy of secondary ions in the case of the hard component on the angle of flight was measured. The mean quantity of inelastic energy loss $\bar{R}$ at the ion-atom collision was classified. The authors show thatthe magnitude $\bar{R}$ can be manifold greater than the sum of the atom-ionization potentials for all electrons becoming free at the formation of the secondary ion with multiple charge. The authors assume that this is connected with the transfer of a considerable kinetic energy by means of the electrons which are removed from the shells of the ion and the atom in consequence of inelastic collision. They conclude that, with given relative velocity of motion the magnitude $\bar{R}$ is determined by the minimal distance to which the nuclei of colliding atom particles approach. The most probable number of electrons which are removed from the shells of two colliding particles corresponds tothe given magnitude $\bar{R}$,; there are

Card 2/3

Investigation of the Energy of Multi-Charge Ions Formed at the Ionization of Gas Atoms by Positive Ions. 57-11-18/33

1o figures and 5 Slavic references.

ASSOCIATION: Leningrad Physical-Technical Institute AN USSR(Leningradskiy Fiziko-tekhnicheskiy institut AN SSSR)

SUBMITTED: April 23, 1957

AVAILABLE: Library of Congress

Card 3/3

Fedorenko, N. V.

AUTHORS: Afrosimov V. V., Fedorenko, N. V. 57-11-19/33

TITLE: The Investigation of the Angular Distribution of Secondary Ions Formed at the Ionization of Gas Atoms by Positive Ions (Issledovaniye uglovykh raspredeleniy vtorichnykh ionov, obrazuyushchikhsya pri ionizatsii atomov gaza polozhitel'nymi ionami)

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 11, pp. 2573-2582 (USSR)

ABSTRACT: The conditions on which the inelastic processes occur which are connected with the ionization of gas-atoms, i.e. of the atom particle struck, are explained. The angular distributions of Ar^+ Ar^{2+}, Ar^{3+}, Ar^{4+}, Ar^{5+}, Ar^{6+} - secondary ions which are formed in consequence of the ionization of argon atoms by Ar^+ ions with an energy of from 10 to 154 keV as well as by Ne^+- ions with an energy of 75 keV at single collisions, are investigated. Aslo the angular distributions of Ne^+, Ne^{2+}, Ne^{3+} - secondary ions which are formed at the ionization of neon- atoms by Ar^+- ions with an energy of 75 keV are investigated. The angular distributions were investigated within a range of the angle of flight of $77^o \leq \varphi \leq 92^o$ (i.e. the angle between the direction of motion of secondary ions and that of the primary beam). With every angular -distribution curve a maximum was found. The angle of flight corresponding to the position of the maximum decreases with the increase of the charge of secondary ions as well as with the decrease of the ki-

Card 1/2

The Investigation of the Angular Distribution of Secondary Ions Formed at the Ionization of Gas Atoms by Positive Ions. 57-11-19/33

netic energy of primary ions. In the case of a decrease of the charge of secondary ions the mean kinetic energy of ions increases. From the experimental results the authors conclude that the probability of ionization increases with the removal of a great number of electrons in the case of a greater approach of the nuclei of colliding particles. By means of a comparison of the investigations of the present work with that of Kaminker,D.M. and N.V. Fedorenko in Zhurnal Tekhn.Fiz., 1955,Vol. 25, pp.2239 the presence of a relation between the angular distribution in the case of inelastic dispersion of the stricking as well as of the target atom particle is stated. There are 6 figures, 1 table and 5 Slavic references.

ASSOCIATION: Leningrad Physical-Technical Institute AN USSR (Leningradskiy fiziko-tekhnicheskiy institut AN USSR)

SUBMITTED: April 23, 1957

AVAILABLE: Library of Congress.

Card 2/2

FEDORENKO, N.V.

66702

24,2120 SOV/109-4-8-22/35

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics, MOSCOW, 2-6 OCTOBER 1958,

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

ABSTRACT: The conference was organised by the Ac.Sc.USSR, the Ministry of Higher Education and Moscow State University. It was opened by the chairman of the organising committee, M.A. Leontovich, Academician. During the plenary sessions of the conference, a number of survey papers were delivered. L.A. Artsimovich read a paper on "Production of Ultra-high Temperatures in Plasma". A survey of the optical method of measurements was given in the papers by V.A. Fabrikant and S.E. Frish. S. Brown of the Massachusetts Institute of Technology gave a survey of the high-frequency methods of the investigation of stationary and non-stationary plasma (see p 1244 in this issue of the journal). N.V. Fedorenko read a paper entitled "Ionisation and Inelastic Scattering During Atomic Collisions".

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L.A. Sena and Ye.M. Kagan deal with "Elementary Processes of Determining the Motion of Ions in Gas". A paper by Ye. Bedereu (Rumania) dealt with "The Role of Resonance-recharging in the Kinetics of Ions". I.S. Stekol'nikov considered the initial stages of the development of sparks (corona-leader, main channel and the final channel). B.N. Klyarfel'd gave a survey of the ignition processes of the discharges in highly rarified gases. The mechanism of the breakdown of a high-vacuum gap was elucidated in a paper by V.L. Granovskiy. L. Tonks (USA) expounded a theory of the motion of electrons in a magnetic trap (see p 1316 of this journal). Academician R. Rompe (Eastern Germany) described a number of experiments on non-stationary plasma conducted by himself. M. Steenbeck (Eastern Germany) gave a generalised theory of plasma. The conference was divided into six sections. The first section was presided over by L.A. Sena and was concerned with the elementary processes in gas discharges. The following papers were read in this section: Ya.M. Fogel' - "Transformation of Positive Ions Into Negative Ones in Rarified Gases". Ya. M. Fogel' with V.A. Ankudinov and D.V. Pilipenko - "Capture and Loss of Electrons During the Collision of Fast Atoms of Carbon and Hydrogen with the Molecules of Gases". N.V. Fedorenko et al. - "Dissociation of Molecular Ions of Hydrogen During Collisions in Gas". I.P. Flaks and Ye.S. Solov'yev - "Capture Cross-sections of Electrons in Multicharge Ions in Inert Gases". R.M. Kushnir et al. - "Experimental Investigation of the Resonance Recharging in Certain Single-atom Gases and Metal Vapours". O.B. Firsov - "Qualitative Investigation of Inelastic Collisions of Atoms". L.M. Volkova - "Effective Excitation Cross-sections of the Spectral Lines of Potassium and Argon".

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I.P. Zapesochnyy and S.M. Kishko "Some Results of the Investigation of the Optical Functions of the Excitation Bands of a Negative System". A.A. Vorob'yev and A.G. Vlasov - "Investigation of the Scattering of the Electrons in a Betatron Chamber". The second section was presided over by B.N. Klyarfel'd and was devoted to the problems of the electrical breakdown in rarified gases and in high vacuum. The following papers were read in this section: G.Ya. Makar-Limanov and Yu.A. Metlitskiy - "Electrostatic Control of the Ignition of Glow-discharge Tubes" (see p 1274 of the journal). S.V. Ptitsyn et al. were concerned with the breakdown in a high-voltage mercury rectifier (see p 1278 of the journal). L.G. Guseva "Ignition of the Discharge in Non-uniform Fields at Low Gas Pressures" (see p 1260 of the journal). A.S. Soboleva and B.N. Klyarfel'd - "The Discharge Phenomena Between a Point and a Plane at Gas Pressures of 10^{-3} - 1 mm Hg".

FEDORENKO, N.V.

FEDOFENKO, N. V., AFROSIMOV, V. N., IL'IN, R. N.

"Ionization of Molecular Hydrogen by Protons,"

paper presented by Fedorenko at Conf. on physics of Electronics & Atomic Collisions, New York University, 27-28 Jan 1958.

B - 3,102,929

24(7)

SOV/57-28-10-27/40

AUTHORS: Afrosimov, V.V., Il'in, R.N., Fedorenko, N.V.

TITLE: Ionization of Argon by Hydrogen Ions (Ionizatsiya argona ionami vodoroda)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2266-2274 (USSR)

ABSTRACT: This work was intended to furnish information on the charge composition of the secondary ions and on the total cross section, which can be ascribed to the production of free electrons and of secondary ions in the collision of hydrogen ions with the argon atoms. Argon was used as a gas target for the reason that it yields the most detailed data on the ionization by electrons and ions. The experimental method has already been described accurately in the papers cited by references 1 and 2. The experimental set-up as a whole has been described in the paper cited by reference 9. In this paper only a short description of the experimental conditions is included. The charge composition of the secondary ions of argon which are produced by a single collision of the H^+, H_2^+, and H_3^+ ions with the argon atoms was the object of study in this work. The energy interval of the primary ions extended from

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Ionization of Argon by Hydrogen Ions

5 - 180 keV. The following quantities were determined: The total cross section of electron capture by hydrogen ions (σ_0) and the total cross section of free electron production (σ_-) and of Ar^+, Ar^{2+}, Ar^{3+}, and Ar^{4+} secondary ion production, which are denoted by σ_{01}, σ_{02}, σ_{03}, and σ_{04}, respectively. It was found that σ_0 in all cases decreases continuously with an increase in the velocity of the primary ions, whereas the curves $\sigma_-(v)$ exhibit a maximum. This maximum is located near velocities which are about the value $e^2/\hbar$ (according to Bohr (Bor) the velocity of the electron in the hydrogen atom equals $2{,}2.10^8$ cm/sec). The curves $\sigma_{02}(v)$, $\sigma_{03}(v)$ and $\sigma_{04}(v)$ exhibit a maximum in the same velocity region. The maximum values of the corresponding cross sections for an electron impact are, according to data provided by W. Bleakney (Blikni) (Ref 3) by many times smaller. The cross sections of the production of secondary argon ions by ions H^+, H_2^+, and H_3^+ are

compared to those of the production by He^+ and Ne^+ ions travelling with the same velocity, the pertaining data being provided by reference 2. It appears that the cross sections of the production of Ar^{2+}, Ar^{3+} and Ar^{4+} ions increase with the nuclear charge of the ionizing particles. If the ionizing particles are multiatomic molecules the corresponding cross sections increase with the increase in the number of the nuclei contained in the primary ion. Professor V.M. Dukel'skiy and O.B. Firsov discussed the work with the author. There are 8 figures, 1 table, and 14 references, 8 of which are Soviet.

SUBMITTED: January 17, 1958

SOV/56-34-6-5/51

AUTHORS: Afrosimov, V. V., Il'in, R. N., Fedorenko, N. V.

TITLE: The Ionization of Molecular Hydrogen by the Ions H^+, H_2^+ and H_3^+ (Ionizatsiya molekulyarnogo vodoroda ionami H^+, H_2^+ and H_3^+)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 34, Nr 6, pp 1398 - 1405 (USSR)

ABSTRACT: This paper investigates the ionization of hydrogen by the ions H^+, H_2^+ and H_3^+ and the distribution of the secondary ions with respect to e/m in the energy interval from 5 - 180 keV. The experimental device and the method of the investigation were described in a previous paper of the authors (Ref. 14,15). The beam of the primary ions (which is homogeneous with respect to the energy and composition) entered a collision chamber. The low pressure (from 1.10^{-4} to $1,5.10^{-4}$ torr) implied the homogeneousness of the collisions of the primary ions with the gas molecules. For the analysis of the secondary ions with respect to e/m a magnetic mass spectrometer (with sectors) was

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connected with the collision chamber. The ion currents in the analysator amounted to 2.10^{-16} - 2.10^{-15} A. Three diagrams show the total cross sections of the capture of the ions H^+, H_2^+ and H_3^+; these cross sections are plotted against the velocity of the primary ions. The first diagram gives also the theoretical dependence for the charge-exchange of protons in atomar hydrogen. The pair H_2^+ - H_2 is not a resonance pair. It seems that the electron is captured to an excited level of the molecule H_2. The capture of an electron by the ion H_3^+ is a complex process as the stable state of the molecule H_3 is not known. This capture probably causes the dissociation of H_3^+ into a molecule H_2 and a hydrogen atom. The cross section $\sigma_{H_2^+}$ of the production of the secondary ions H_2^+ is the sum of the cross sections of the ordinary charge exchange and of the ionization with the removal of one electron. In the region of the velocities of the primary

The Ionization of Molecular Hydrogen by the Ions H^+, H_2^+ and H_3^+

ions $v < e^2/\hbar$ the cross section of the ordinary charge exchange forms the main portion of the cross section $\sigma_{H_2^+}$. But in the region $v > e^2/\hbar$ the principal part of $\sigma_{H_2^+}$ is formed by the cross section of the ionization. In the region $v > e^2/\hbar$ the cross section $\sigma_{H_2^+}$ is the greater the more nuclei make up the primary ion. In the same region $\sigma_{H_2^+}$ decreases continuously when the velocity of the primary ions increases, and it is greater than the corresponding cross section of the electronic impact. The following part of this paper deals with the production of secondary protons. The cross section of this production is smaller than the cross section of the production of the molecular ions H_2^+. The secondary protons are produced mainly by the dissociation of H_2^+ ions. The last part of this paper deals with the productions of free electrons. The authors thank V.M.Dukel'skiy, Professor, and O.B.Firsov for the discussion of this paper and for useful critical remarks.

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The Ionization of Molecular Hydrogen by the Ions H^+, H_2^+ and H_3^+

SOV/56-34-6-5/51

There are 7 figures, 1 table, and 16 references, 4 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physical-Technical Institute AS USSR)

SUBMITTED: January 8, 1958

FEDORENKO, N.V.

18(6) PHASE I BOOK EXPLOITATION SOV/3199

Akademiya nauk SSSR. Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova

Analiz blagorodnykh metallov (Analysis of Noble Metals) Moscow, 1959. 193 p. Errata slip inserted. 2,700 copies printed.

Resp. Ed.: N. K. Pshenitsyn, USSR Academy of Sciences, Corresponding Member; and O. Ye. Zvyagintsev, Doctor of Chemical Sciences; Eds. of Publishing House: T. G. Levi, and D. N. Trifonov; Tech. Ed.: I. N. Guseva.

PURPOSE: This collection of articles is for scientists engaged in the study and analysis of the noble metals.

COVERAGE: This is a collection of articles on the analysis of the noble metals. It includes studies carried out by the Institute of General and Inorganic Chemistry im. N. S. Kurnakov (AN SSSR), as well as reports presented by scientific research organizations and by industrial enterprises at the Third and Fourth Conference on Noble Metals held in 1954 and 1957, respectively. The studies and reports describe new organic reagents for gravimetric determination of platinum metals, and physicochemical methods of analysis (spectrophotometric, polarographic and potentiometric). Special attention is given to spectral analysis for the determination of admixtures in alloys of platinum metals, silver, and gold, as well as in refined noble metals. The collection also includes analytical methods, tables and charts for materials containing metals of the platinum group, as well as a review of the literature on the analysis of platinum metals published in the last five years. No personalities are mentioned. References follow each chapter.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000412610013-3"

FEDORENKO, N.V.; FLAX, I.P.; FILIPPENKO, L.G.; SOLOVYEV, E.S.

"Electron Capture by Multiply Charged Ions."

report presented at the 4th Intl Conference on Ionization Phenomena in Gases, Uppsala, 17-21 August 1959.

FEDORENKO, N.V.; AFROSIMOV, V.V.; IL'IN, R.N.; SOLOVYEV, E.S.

"Ionization of Inert Gases by Protons."

report presented at the 4th Intl Conference on Ionization Phenomena in Gases, Uppsala, 17-21 August 1959.

24(5) SOV/56-36-1-7/62

AUTHORS: Il'in, R. N., Afrosimov, V. V., Fedorenko, N. V.

TITLE: Ionization of Air by H^+ and H_2^+ -Ions (Ionizatsiya vozdukha ionami H^+ i H_2^+)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 1, pp 41-48 (USSR)

ABSTRACT: Hitherto, the ionization of air by ions has been investigated mainly in connection with investigations of the energy dependence of the proton range (Ref 1), and ionization cross section was only inaccurately determined (Ref 2). Direct measurements of the ionization cross section in air by protons are not known to the authors. In the present paper collisions between positive hydrogen ions and air molecules are investigated, and the formation of secondary ions by the knocking out of electrons and electron exchange is observed. The total ionization cross section is measured by means of electron recording during the passage of an ion beam through air. The simultaneous electron capture of H-ions was already investigated by reference 4. The investigation of the composition of the secondary ions was carried out by means of a mass

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spectrometer. Also the production cross sections for these ions was determined. The measuring method was already described in references 3 and 5 and is discussed in short. The monochromatic ion beam penetrates into a collision chamber in which air pressure amounts to $1.5\ 10^{-4}$ torr. It contains a measuring condenser, which, by means of an ion current, permits determination of σ_+ and σ_- cross sections. The total capture cross section is $\sigma_{10} = \sigma_+ - \sigma_-$, and for the production cross section of secondary ions it holds that $\sigma_{A^{n+}} = \frac{1}{n}\sigma_+ \alpha_{A^{n+}}$ ($\alpha_{A^{n+}}$ = relative intensity of A^{n+}-ions). The total measuring error amounted to about ± 12 %, in which case ± 6 % related to pressure- and ± 6 % to current measurements. Spectrum lines were recorded of the following ions: N_2^+, O_2^+, N^+, O^+, N^{++}, O^{++}, Ar^+, and in the residual gas (after evacuation of the chamber, pressure 5.10^{-6} torr) H^+, H_2^+, and H_2O^+. A spectrogram of these secondary ions is shown by figure 1.

Results: Total capture cross section of electrons by primary ions: Results are given by figure 2 (energy dependence of σ_{10}, comparison between measured data with the results of references 4, 7, 6).

Ionization of Air by H^+ and H_2^+ -Ions

Total ionization cross section σ_-: Energy dependence $\sigma_-(E_{H^+, H_2^+})$ is shown by figure 4, the velocity dependence by figure 5. For H^+ at 60 keV, $\sigma_- \approx 6.3.10^{-16}$ cm^2 and for H_2^+ at 140 keV: $\sigma_- \approx 1.2.10^{-15}$ cm^2 is given. The maximum in an energy range of 50 - 120 keV is given as amounting to (8.6 - 12.5).10^{-16} cm^2. From measurement of velocity dependence it follows that air ionization by protons and H_2^+-ions takes place in the velocity range of $v < e^2/\hbar$, where there is no ionization by an electron collision.

Production cross section of secondary ions: Figure 6 shows the energy dependence of $\sigma_{A^{n+}}$ in the case of ionization by protons, figure 7 shows the same in the case of ionization by H_2^+-ions. The formation of simply charged molecule ions in nitrogen and oxygen was also investigated, the dependence of $\sigma_{A^{n+}}$ on the velocity of primary ions is shown for nitrogen by figure 8 and for oxygen by figure 9. Further, results of production cross section measurements of single - and double-charge atom ions in nitrogen and oxygen are given. The production cross sections $\sigma_{O^{++}}$ and $\sigma_{N^{++}}$ have a maximum at $v \approx (1 - 1.5)\ e^2/\hbar$: $\sigma_{O^{++}} \approx 1.10^{-17}$ cm^2 and $\sigma_{N^{++}} \approx 8.3.10^{-18}$ cm^2, and in the case of ionization by H_2^+: $\sigma_{O^{++}} \approx 2.9.10^{-17}$ cm^2

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Ionization of Air by H^+ and H_2^+ -Ions

and $\sigma_{N^{++}} \approx 2.4.10^{-17}$ cm^2. The authors finally thank Professor V. M. Dukel'skiy and also O. B. Firsov for their advice and discussions. There are 9 figures, 1 table, and 12 references, 4 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physico-Technical Institute of the Academy of Sciences, USSR)

SUBMITTED: July 29, 1958

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5(4),24(0) SOV/56-36-2-6/63

AUTHORS: Fedorenko, N. V., Afrosimov, V. V., Il'in, R. N., Kaminker, D. M.

TITLE: The Dissociation of the Molecular H_2^+-Ion in Collisions ina Gas (Dissotsiatsiya molekulyarnogo iona H_2^+ pri stolknoveniyakh v gaze)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 385-392 (USSR)

ABSTRACT: In the introduction, the following possible dissociation processes in inelastic collisions are discussed:

$H_2^+ \rightarrow H_2^0$ $\quad$ $H_2^+ \rightarrow H^- + H^+$

$H_2^+ \rightarrow H^0 + H^0$ $\quad$ $H_2^+ \rightarrow H^+ + H^0$

$H_2^+ \rightarrow H^- + H^0$ $\quad$ $H_2^+ \rightarrow H^+ + H^+$

$H_2^+ \rightarrow H^- + H^-$

The publications dealing with this subject, Fogel' et al. (Ref 1), Salpeter (Ref 2), Effat (Ref 3), Fedorenko (Ref 4), Damodaran (Ref 5) and others are discussed.

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SOV/56-36-2-6/63

The Dissociation of the Molecular H_2^+-Ion in Collisions in a Gas

The present paper gives a report on the results obtained by measurements of proton formation cross sections in a energy interval that is between the intervals investigated by references 4 and 5. Investigations were carried out in the atomic gases helium and argon as well as in the molecular gases hydrogen and air. Measurements were carried out in a mass-spectrometrical device such as is described by references 8 and 9. The collision chamber and the analyzer used is shown in form of a schematical drawing (Fig 1) and is described. For the investigation of scattering a similar method was used as in references 11 and 12. Measurements were carried out for H_2^+-ion energies (T) between 5 and 180 kev. The formation cross sections for protons and H^--ions were investigated; results are shown by diagrams (Figs 2-5). For hydrogen and helium the course $\sigma_{H^+}(T)$ shows two maxima, a broad one in the range of 100 - 160 kev, and a smaller one at about 15 kev (Figs 2, 4). For argon and air the curve at first takes a curved, and from about 40 kv onwards, a nearly linearly rising course (Figs 3, 5). The cross section of the formation of negative ions was measured

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only in argon for 12 kev σ_{H^-} $1.6.10^{-18}cm^2$. With an energy increase of up to 180 kev, σ_{H^-} showed a monotonously steep increase. The authors further investigated the angular distribution of H_2^+-ions with a primary energy of 24 kev scattered in argon without a change of e/m, as well as the distribution of the H^+ and H^- ions formed as a result of dissociations. Figure 6 shows the course followed by the angular distribution f (θ) in collision chambers with 5.10^{-6}torr and $1.5.10^{-4}$torr(Ar). The authors arrive at the conclusion that with a decrease of the distance of closest approach of the nuclei of the colliding atomic particles, the relative probability of scattering with dissociation increases. The authors finally thank O. B. Firsov and V. M. Dukel'skiy for discussions. There are 6 figures and 20 references, 13 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physico-Technical Institute of the Academy of Sciences, USSR)

SUBMITTED: July 29, 1958

24.6200,16.8100

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SOV/56-37-6-40/55

AUTHORS: Fedorenko, N. V., Belyaev, V. A.

TITLE: Letter to the Editor. Maximal Cross Section of a Nonresonance Charge Exchange

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1808-1810 (USSR)

ABSTRACT: The reaction $1^+ + A \longrightarrow 1^o + A^+ \Delta E$ (where ΔE is defect in resonance) was taken as the definition of the nonresonance one-electron charge exchange. The previous studies of N. V. Fedorenko (cf., Zhur. Eksp. i Teoret. Fiz., 24, 2113, 1954) and N. V. Fedorenko, V. V. Afrosimov and D. M. Kaminker (cf., ibid., 26, 1929, 1956) show that with an increase in the absolute magnitude of the resonance defect $|\Delta E|$ the velocity corresponding to the maximal cross section (σ_{max}) increases according to the Massy criterion. An analysis was made which determined the effect of σ_{max} on the absolute magnitude of the resonance defect and on the numerical order of

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the atom-target, N. It was shown that σ_{max} increases with an increase in N and decreases with an increase in $|\Delta E|$. Two characteristic cases are possible for an ion and different atoms: (1) If $|\Delta E|$ increases uninterruptedly and N decreases, the σ_{max} decreases rapidly so that both factors act in the same direction; (2) If both $|\Delta E|$ and N increase, both factors have the effect in the opposite directions, and the term σ_{max} gradually increases in its transition from one atom to another. These characteristics are illustrated graphically in the figure below:

Letter to the Editor. Maximal Cross Section of a Nonresonance Charge Exchange

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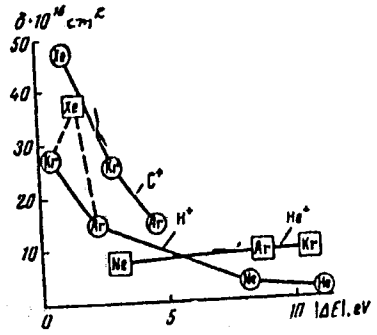

The graph shows the relation between σ_{max} ($|\Delta E|$) for one-electron charge exchange C^+, He^+, and H^+ in inert gases. The points corresponding to charge exchange of the same ion are connected by a line. The increase in σ_{max} with increase in N during charge exchange in inert gases can be explained by the increase in the dimension of the external shell of

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Letter to the Editor. Maximal Cross Section of a Nonresonance Charge Exchange

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the target atom or by the decrease of the first ionization potential. A similar increase in σ_{max} with an increase in N and a decrease in $|\Delta E|$ was also observed for two-electron charge exchange of He^+ ions in inert gas, which leads to the formation of metastable He^- ions (cf., V. M. Dukel'skiy, V. V. Afrosimov, N. V. Fedorenko, Zhur. Eksp. i Teoret. Fiz., 30, 792, 1956). There is 1 graph; and 11 references, 6 Soviet, 4 U.K., 1 U.S. The U.S. and U.K. references are: J. B. Hasted, Proc. Roy. Soc., A205, 421 (1951); J. B. Hasted, Proc. Roy. Soc., A212, 235 (1952); J. B. H. Stedeford, J. B. Hasted, Proc. Roy Soc., A227, 466 (1955); H. B. Gilbody, J. B. Hasted, Proc. Roy Soc., A238, 334 (1957); R. J. Carbone, E. N. Fales, E. Everhart. Phys. Rev., 102, 1524 (1956).

ASSOCIATION: Leningrad Phys.-Tech. Institute Academy of Sciences USSR (Leningradskiy fiziko-tekhnicheskiy institut, Akademii nauk SSSR)

SUBMITTED: August 14, 1959

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21 (8) SOV/53-68-3-7/11

AUTHOR: Fedorenko, N. V.

TITLE: Ionization in Collisions of Ions With Atoms (Ionizatsiya pri stolknoveniyakh ionov s atomami)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 68, Nr 3, pp 481-511 (USSR)

ABSTRACT: The present article gives a detailed survey of experimental methods and of the present stage of the results of the aforementioned ionization effects. Above all, the ionization by electron loss is investigated while the processes of electron capture are dealt with in a cursory manner only. Energy is divided into 3 ranges: The ev-range ($E < 1000$ ev), the kev-range ($1 \leq E \leq 1000$ kev) and the Mev-range ($E > 1$Mev). The survey is confined to ion energies in the ev- and kev-range. Section I: The total ionization cross section (the ionization processes and the methods of determining the total ionization cross section, experimental data of the years 1950-58, 2 tables, 3 diagrams composed from numerous publications (among others Fedorenko, Afrosimov, Kaminker, Il'in); interpretation of data given on the basis of simple examples $H^+ - H$, $H^+ - He$, $H^+ - H_2$, theory developed by Firsov, dependence of the total ionization cross

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Ionization in Collisions of Ions With Atoms

section on velocity according to Firsov (Fig 4)). Section II: Ionization in the case of the formation of multiply charged ions (experimental determination of cross section, formation of secondary ions; table 3 gives a summary of results obtained in the kev-range, figure 5 - the formation of secondary Ar-ions with primary to quintuple load by He^+ according to Fedorenko and Afrosimov, figure 6 shows the dependence of the formation cross section of simply charged secondary ions on the velocity of various primary ions; figure 7 shows the same for triply charged secondary ions; formation of secondary fragment ions - result of a dissociation; figures 8 and 9 also show the velocity dependence of the formation cross section; stripping of primary ions, table 4). III: Scattering in collisions of ionizations (general theoretical discussions, discussion of a velocity diagram for an inelastic collision of two particles of the same mass, experimental investigation of angular distribution, schematical representation of a device for the investigation of scattering processes according to Fedorenko, Afrosimov, and Kaminker (Fig 11); scattering of primary ions with a variation of e/m (angular distribution of arlons ionized with difference intensity, figure 12); scattering of secondary

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ions (Figs 13, 14); the approximation of nuclei and the inelastic processes (Figs 15, 16), the energy losses in inelastic processes (Fig 17, Table 5). The entire material was obtained from already published articles. There are 17 figures, 5 tables, and 68 references, 31 of which are Soviet.

24.2120,24.6000

77329
SOV/57-30-1-8/18

AUTHORS: Fedorenko, N. V., Filippenko, L. G., Flaks, I. P.

TITLE: Scattering of Multiple Charged Ions With Simultaneous Electron Capture

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol 30, Nr 1, pp 49-56 (USSR)

ABSTRACT: Introduction: Except for the Ar^{2+} Ar^{+}, scattering of multiple charged ions with simultaneous partial or total neutralization has not yet been studied, and the authors undertook to measure the scattering of particles obtained from primary Kr^{+}, Kr^{2+}, Kr^{3+}, and Ne^{2+} ions after their partial or total neutralization in neon or crypton. The authors investigated at the same time the small angle scattering of ions without change in charge which can differ from the elastic process by exciting or ionizing the atoms of the scatterer. (I) Methods of measurements: The apparatus consisted of a mass-monochromator producing a

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monoenergetic primary ion beam, a scattering chamber, and a movable magnetic analyzer. The diagram is shown in Fig. 1.

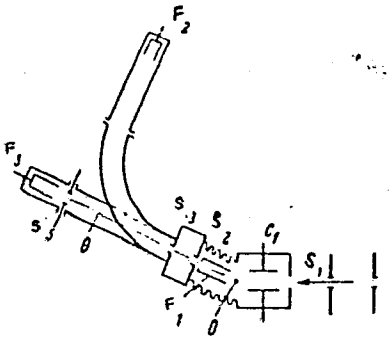

Fig. 1. Schematic drawing of the collision chamber and the analyzer. (O) center of rotation of the analyzer; (C_1) deflecting condenser; (F_1) collector of the primary beam; (F_2) collector of fast ions; (F_3) collector of fast neutral atoms; (S_1) entrance slit of the collision chamber (size 4 × 1 mm); (S_2) exit slit of the collision chamber (size 10 × 1 mm); (S_3) adjustable entrance slit of the receiver F_2; (S_5) entrance slit of the receiver F_3 (size 4 × 3.1 mm).

Scattering of Multiple Charged Ions With Simultaneous Electron Capture

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Neutral particles reaching F_3, described in detail by Flaks and Solov'yev (ZhTF, XXVIII, 599, 1958) were registered by means of secondary emission. All measurements were made for incoming ion energy of 33 kev. Keeping the pressure between 0.5 and $1 \cdot 10^{-4}$ mm Hg the authors maintained single collision conditions. Incoming beam was of the order of 10^{-7} a, for singly ionized atoms and 10^{-8} to 10^{-9} a, for the doubly and triply ionized atoms. They measured differential cross section not smaller than $1 \cdot 10^{-16}$ $cm^2 \cdot sterad^{-1}$ for singly ionized atoms, $1 \cdot 10^{-15}$ $cm^2 \cdot sterad^{-1}$ for doubly, and $1 \cdot 10^{-14}$ $cm^2 \cdot sterad^{-1}$ for triply charged ions. Investigation in the 2.5 to 8^o region showed that in this interval the effects are below the sensitivity of the apparatus. Probable error was between

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± 20 and 25%. (II) Results of measurements: Figure 3 and 8 represent typical results. Overall cross section was defined as

$$G(\theta)=\sum_{f=0}^{i}\left(\frac{d\sigma}{d\omega}\right)_{if} \qquad (2)$$

The authors concluded that, (1) scattering with a total neutralization of primary ions favors smaller scattering angles while processes with partial neutralization occupy a wider region; this is true in the case of scattering on the same kind of gas or on a "foreign" element. (2) The larger the number of electrons captured during the full neutralization, the wider the scattering angle distribution of particles (see Fig. 8). (III) Evaluation of results: The authors estimated the value of the total cross-section using the equation

$$\sigma_{if}=2\pi\int_{0}^{\theta_{max}}\left(\frac{d\sigma}{d\omega}\right)_{if}\sin\theta d\theta \qquad (3)$$

Card 4/10 where θ_{max} fixed the angle beyond which the effects

Scattering of Multiple Charged Ions With Simultaneous Electron Capture

77329
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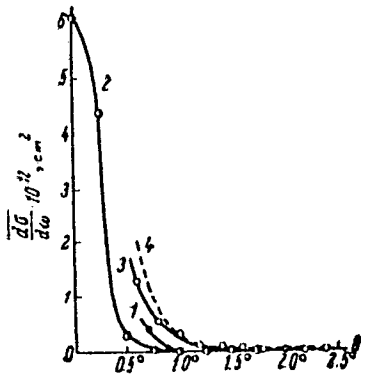
Fig. 3. Scattering of Kr^{2+} ions in Kr. (1) scattering without change or charge; (2) transition $Kr^{2+} \rightarrow Kr^{o}$; (3) transition $Kr^{2+} \rightarrow$ $\rightarrow Kr^{+}$; (4) overall cross section $G(\theta)$.



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Scattering of Multiple Charged Ions With Simultaneous Electron Capture

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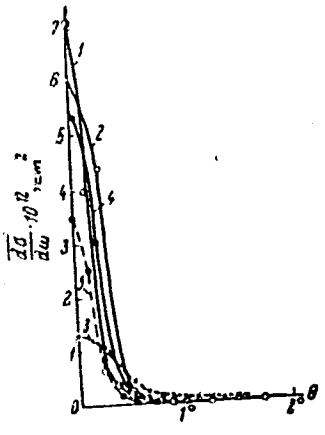
Fig. 8. Scattering with full neutralization of primary ions. (1) $Kr^{+} \rightarrow Kr^{0}$ in K (ordinate five times reduced); (2) $Kr^{2+} \rightarrow Kr^{0}$ in Kr; (3) $Kr^{3+} \rightarrow Kr^{0}$ in Kr; (4) $Ne^{2+} \rightarrow Ne^{0}$ in Kr; (5) $Ne^{2+} \rightarrow Ne^{0}$ in Ne.



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were below the sensitivity of the apparatus. Compared with results obtained by Flaks and others, who measured the cross sections directly, the discrepancy was never greater than 45%, which was within the limit of errors of both sets of measurements. To estimate the distance of approach, the authors used the classical representation of trajectories, justified in view of the small incident energies, and computed the sighting parameter $\bar{\rho}(\theta_0)$

$$\rho(\theta_0) = \sqrt{2\int_{\theta_0}^{\theta_{max}} \left[\sum_f \left(\frac{d\bar{\sigma}}{d\omega}\right)_{if}\right] \sin\theta d\theta} = \sqrt{2\int_{\theta_0}^{\theta_{max}} G(\theta)\sin\theta d\theta}. \quad (6)$$

Table 2 contains computed values of $\bar{\rho}(\theta_0)$ along with the values of θ_0 for which the sighting parameter is practically equal to the smallest internuclear distance r_0 of the two colliding particles.

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Table 2.

Pair	θ_0	$\bar{\rho}(\theta_0)$, Å	$r_i + r_a$, Å
1	2	3	4
Kr^+ in Kr	1.5°	1	8
Kr^{3+} in Kr	0.7	1.5	7.5
Kr^{3+} in Ne	1.1	2.5	5.2
Ne^{3+} in Ne	0.9	7	3.5
Ne^{3+} in Kr	0.9	2	5.7
Kr^{3+} in Kr	0.75	2.3	6

The fourth row in Table 2 was computed using values or formulas from the book by Gambosh (Statistical Theory of Atom and Its Application, IL., M., 1951). Whenever $\bar{\rho}(\theta_0)$ came out larger than $r_i + r_a$, the authors deduced that Eq. (6) in that case is not applicable. The differences in the width of the angular distribution in cases of partial and total neutralization of incoming ions the authors tried to explain in the following manner: At an approach, the potential function of the ion and atom

looks like V(r) curve 1 in Fig. 9.

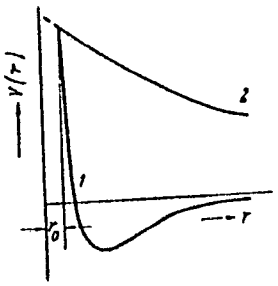

Fig. 9.

If there is no change in ionization or if there is a total neutralization, the V(r) curve remains the same. In the case of a partial neutralization, however, the interaction after collision is given by the Coulomb curve 2. Professors V. M. Dukel'skiy and D. M. Kaminker discussed the results, and A. M. Shchenkov helped in the adjustment of the experimental devices. There are 9 figures; 2 tables; and 13 references, 10 Soviet, 3 U.S. The U.S. references

Scattering of Multiple Charged Ions With Simultaneous Electron Capture

77329
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are: E. Everhart. R. S. Carbone, G. Stone, Phys. Rev., 98, 1045 (1955); R. S. Carbone, E. N. Fuls, E. Everhart, Phys, Rev., 102, 1524 (1956); P. R. Jones, F. P. Ziemba, H. A. Moses, E. Everhart, Phys. Rev., 113, 182 (1959).

ASSOCIATION: Physico-Technical Institute AS USSR, Leningrad C. (Fiziko-tekhnicheskiy institut AN SSSR, g. Leningrad)

SUBMITTED: July 20, 1959

Card 10/10

FEDORENKO, N.V.

AUTH: 24-2311
3/057/60/030/012/001/011
B019/B056

AUTHORS: Afrosimov, V. V., Gladkikh, V. A., Golant, V. Ye., Zaydel', I. N., Komar, Ye. G., Konstantinov, B. P., Malyshev, G. M., Malyshev, I. P., Rozovskiy, M. A., Stolov, A. M., Fedorenko, N. V.

TITLE: Plasma Studies With "Alfa" Research Installation

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12, pp. 1381 - 1393

TEXT: A research installation for producing high-power pulsed discharges in a toroidal chamber with an average diameter of 3.2 m and an inner cross-section diameter of 1 m is described. The chamber is filled with hydrogen, and discharge is obtained at a pressure of about $2 \cdot 10^{-4}$ mm Hg, and with an external magnetic field of 180-720 oe. Discharges are produced by 2-3 msec electric pulses coming from a capacitor battery capable of storing $1.5 \cdot 10^6$ joules of energy. The entire installation is shown in a photograph, and is schematically represented in Fig.2.

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The electric and magnetic characteristics of a plasma discharge are described in detail, after which microwave studies, spectrum analyses, and studies of the steady flux emitted by the plasma are discussed. The experiments hitherto carried out on "Alfa" show that the production and character of a discharge do not correspond to the general assumptions of a self-constructing quasisteady discharge. The authors formed this opinion owing to the lack of a long plasma column, which follows from measurements of the electric and magnetic characteristics, from microwave studies, from the existence of a large azimuthal current, from the symmetry of discharge, from the occurrence of oscillations therein, and from a considerable inhomogeneity, which is indicated by a large quantity of protons with energies exceeding 10 kev. An explanation of these effects is not possible as yet. There are 6 figures and 22 references: 15 Soviet, 5 English, and 2 US.

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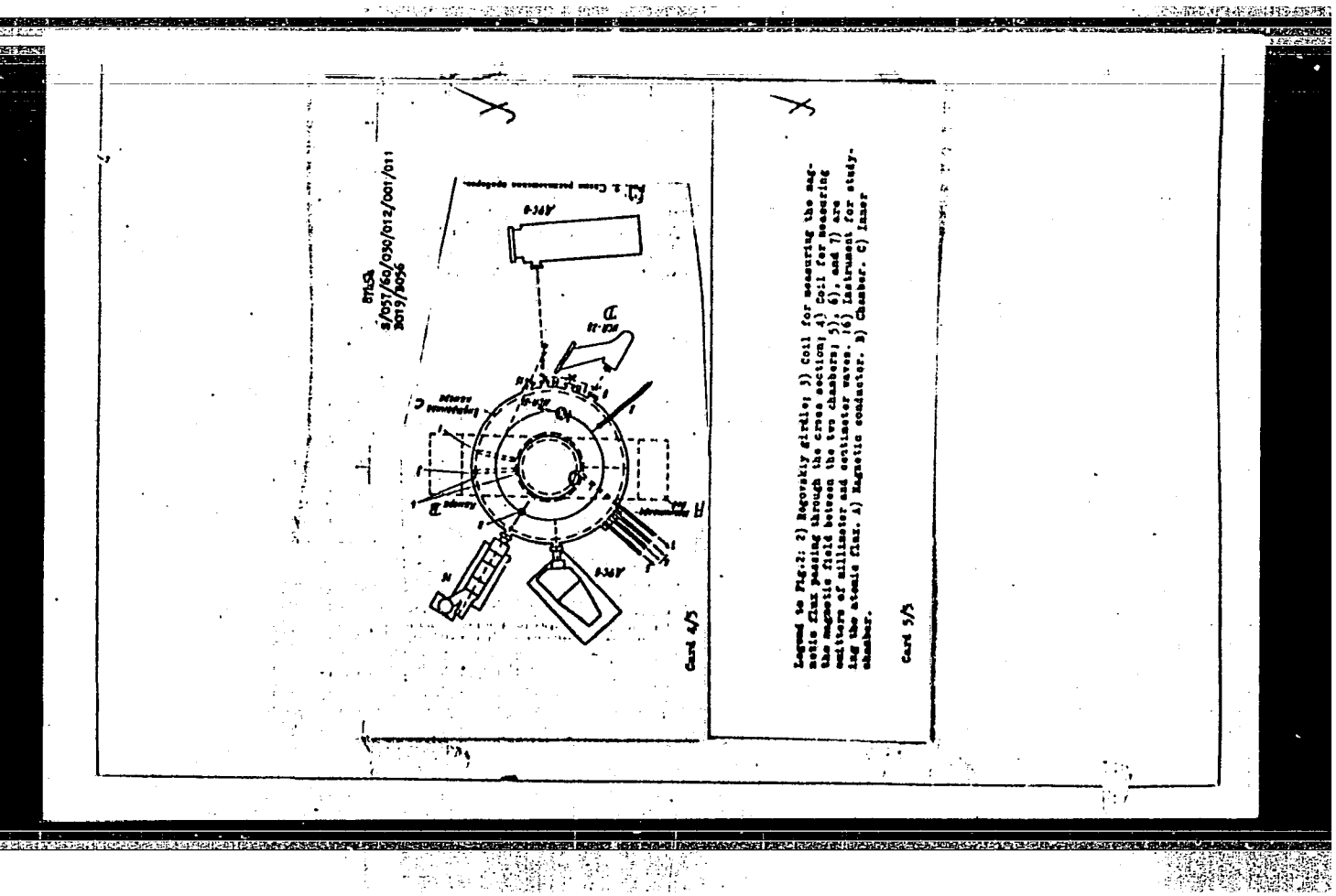
ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Institute of Physics and Technology of the AS USSR). Kazakhskiy filial Akademii nauk SSSR (Kazakh Affiliate of the Academy of Sciences USSR). Laboratoriya elektrofizicheskoy apparatury (Laboratory of Electrophysical Apparatus). Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury (Scientific Research Institute of Electrophysical Apparatus)

SUBMITTED: July 15, 1960

Card 3/3



Legend to Fig.2: 1) Heavisky circle; 2) Coil for measuring the magnetic flux passing through the cross section; 4) Coil for measuring the magnetic field between the two chambers; 5), 6), and 7) are emitters of millimeter and centimeter waves. 16) Instrument for studying the atomic flux. A) Magnetic conductor. B) Chamber. C) Inner chamber.

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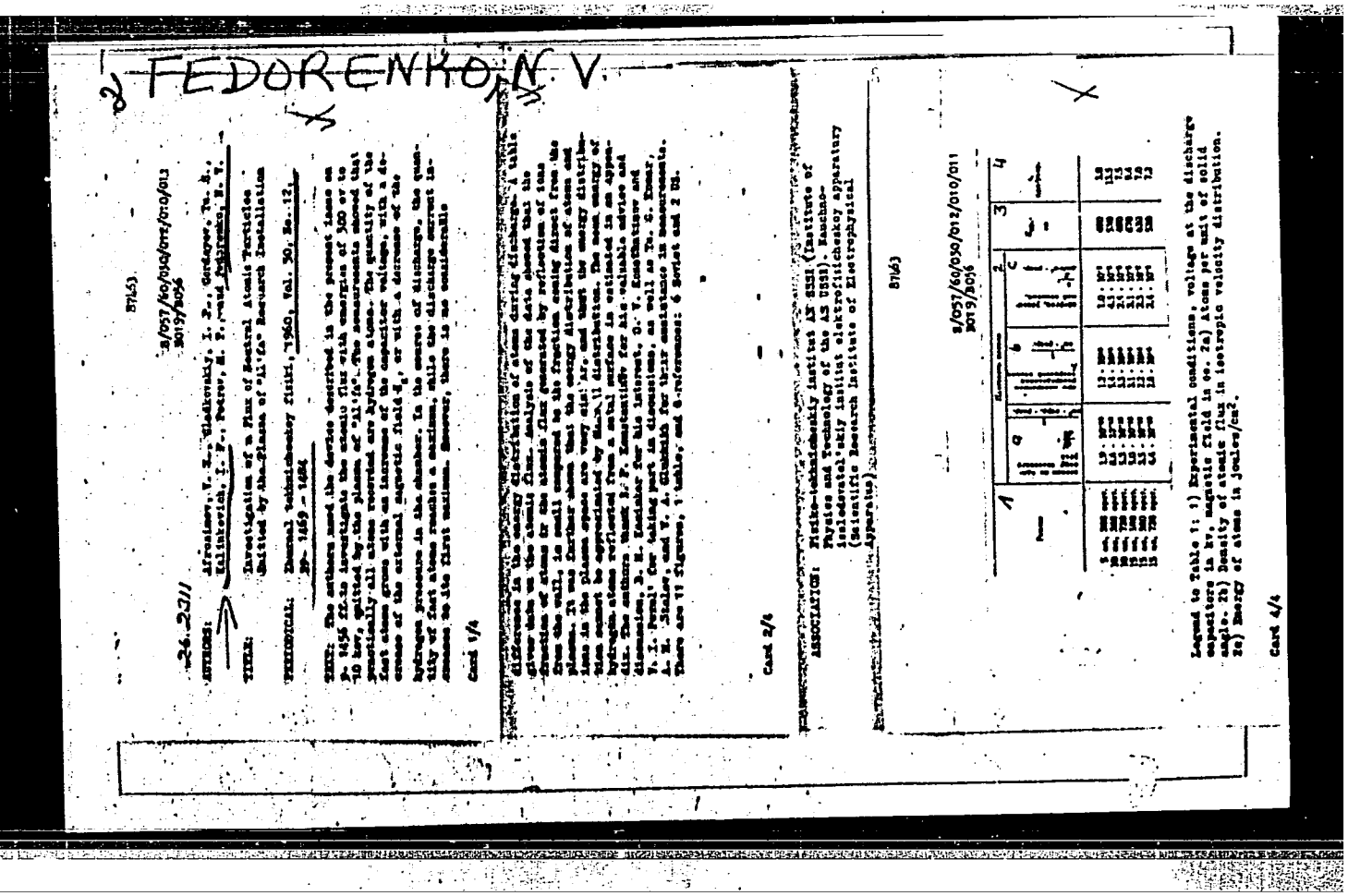
Card 4/5

FEDORENKO, N.V.; FILIPPENKO, L.G.

Ionization of inert gases by multiply-charged ions. Zhur. eksp.i teor.fiz. 38 no.3:719-725 Mr '60. (MIRA 13:7)

1. Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR.

(Ionization of gases)



FEDORENKO, N. V.

B/057/60/030/012/010/011
B019/B056

AUTHORS: Afrosimov, V. V., Gladovskiy, I. P., Gordeyev, Yu. S., Kalinovich, Z. F., Petrov, A. P., and Fedorenko, N. V.

TITLE: Investigation of a Flux of Neutral Atomic Particles Emitted by the Plasma of "Alfa" Toroid Installation

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12, pp. 1459 - 1464

TEXT: The authors used the device described in the present issue on p. 1438 ff.to investigate the atomic flux with energies of 500 eV to 10 keV, emitted by the plasma of "Alfa". The measurements showed that practically all atoms recorded are hydrogen atoms. The quantity of the fast atoms grows with an increase of the capacitor voltage, with a decrease of the external magnetic field H_0, or with a decrease of the hydrogen pressure in the chamber. In the course of discharge, the quantity of fast atoms reaches a maximum, while the discharge current increases to its first maximum. However, there is no considerable

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Card 3/4

B/057/60/030/012/010/011
B019/B056

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Institute of Physics and Technology of the AS USSR). Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury (Scientific Research Institute of Electrophysical Apparatus)

Legend to Table 1: 1) Experimental conditions, voltage at the discharge capacitors in kv, magnetic field in oe. 2a) Atoms per unit of solid angle. 2b) Density of atomic flux in isotropic velocity distribution. 2c) Energy of atoms in joules/cm².

Card 4/4

FEDORENKO, N V

Reports presented at the 5th Intl. Conference on Ionization Phenomena in Gases. Munich, 28 August - 1 September 1961.

a. G A Danilevskaya, A M Andrianov, V F Demichev and V I Vasilyev

"Investigation of a Pulse Discharge in a Hollow Cylindrical Gas Sheath"

b. B O Brezhnev Ya S Mukhinov

"Energy Measurements of Fast Electrons Formed During a Powerful Pulse Discharge" Chamber

c. A B Berezin, A N Zaydel, and G M Malyshev

"On a Method of Spectroscopic Investigation of the Hydrogen Discharge Chamber Walls Interactions"

d. V F Kitayeva N N Sobolev

"On the Hydrogen Lines Broadening Under the Carbon Arc and Detonation Wave Conditions"

e. S G Alikhanov R A Demirkhanov, A V Komin, G G Podlesnyy, G L Khotsyanov

" An Investigation of Plasma Diffusion in the Magnetic Field"

f. V S Komelkov, Yu V Skvortsov V N Tereshchenko S S Tserevitinov

"Dynamical Current Cord"

g. N N Sobolev

"A Spectroscopically Studied State of Gases Following the Detonation Wave"

h. R N Ilin, Ye S Solovyev N V Fedorenko

"Molecular Hydrogen Ionization by Gas Hydrogen Atoms"

i. I P Flaks, G N Ogurtsov

"Ionization of Gases Induced by Multi-charged Ions"

j. P M Morozov, L E Pilgunov

"The Source for Molecular Hydrogen Ions Formation at the Ogra Device"

k. A L Bezbatchenko V V Kuznetsov I P Malakhov N N Semashko

"Injection of an Ionic Beam into the Ogra Magnetic Trap"

l. V Ye Yurasova

"On Directed Emission of Particles from a Copper Single Crystal Sputtered by Bombardment with Ions"

33

AFROSIMOV, V.V.; IL'IN, R.N.; OPARIN, V.A.; SOLOV'YEV, Ye.S.; FEDORENKO, N.V.

Ionization of argon by atoms and singly charged and doubly charged neon and argon ions. Zhur.eksp.i teor.fiz. 41 no.4:1048-1055 O '61. (MIRA 14:10)

1. Leningradskoy fiziko-tekhnicheskiy institut AN SSSR.
(Argon) (Neon) (Ionization of gases)

FEDORENKO, N. V.

87662

S/057/60/030/012/009/011
B019/B056

24.2120

AUTHORS: Afrosimov, V. V., Gladkovskiy, I. P., Gordeyev, Yu. S., Kalinkevich, I. F., and Fedorenko, N. V.

TITLE: Investigation of Atomic Flux Emitted by Plasma

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12, pp. 1456 - 1468

TEXT: The authors developed a method of measuring the flux of uncharged atoms having an energy of 300 ev to some thousand kev. The method is based upon the recording of individual atoms after their ionization and acceleration to 10-20 kev. Fig.1 shows a scheme of this instrument, in which the ionized particles are directed onto an Al-Mg target, where they produced secondary ions which were measured by a scintillation counter. For the calibration of the installation, a special device for monochromatic ions and atoms was used. The calibration curves are shown and discussed in detail. Further, installations are described in detail, which permit the time dependence of the atom flux, the energy distribution, and the mass analysis of the atoms to be determined by an

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[illegible] oscilloscope. The energy distribution of the atoms was studied with the relation $dJ/dE = J_+(E)/\bar{\varepsilon}_0(E)\mu E$, where $J_+(E)$ is the current of secondary ions, and $\bar{\varepsilon}_0(E)$ the mean recording efficiency. The density of the atomic flux was determined from the relation

$$dJ/d\Omega = (1/\Omega S_{eff}) \int_{E_1}^{E_2} J_+(E)dE/\bar{\varepsilon}_0(E)\mu E,$$ where Ω is the mean solid angle,

and S_{eff} the effective plasma surface. For calculating the concentration of atoms per unit volume the formula

$$n_0 = 2\sqrt{2M} \int_{E_1}^{E_2} (dJ/dE)dE/\sqrt{E}$$ was used. By changing Ω, the light intensity s. and the thickness of the gas target, it is possible to improve the sensitivity considerably. The least measured density of the flux of hydrogen atoms having an energy of 300 ev in the case of an isotropic

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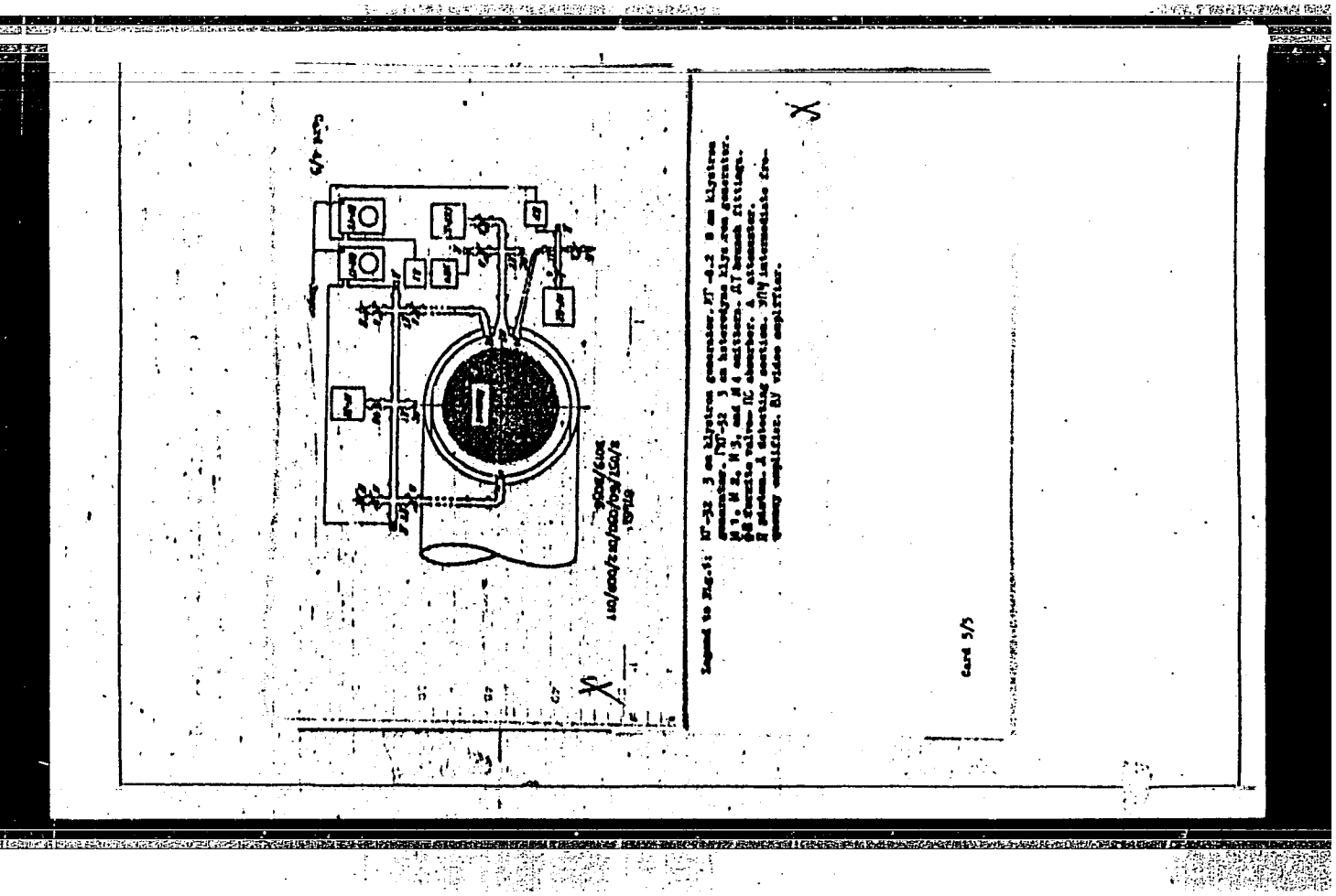

28924
S/056/61/041/004/008/019
B108/B102

26.2340

AUTHORS: Flaks, I. P., Ogurtsov, G. N., Fedorenko, N. V.

TITLE: Production of slow ions in gases by fast atom and ion beams

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 4(10), 1961, 1094-1103

TEXT: The authors determined the production cross section σ_{0k} of slow ions with the charge k in order to explain its dependence on the charge of the primary particles. Collisions between Ne, Ar, Kr, and Xe atoms and fast Ne^0, Ne^+, Ne^{2+}, and Ne^{3+} particles, as well as between Kr and Xe atoms and fast Kr^0, Kr^+, Kr^{2+}, and Kr^{3+} particles have been studied. The experimental arrangement which has been described previously (I. P. Flaks. ZhTF, 31, 367, 1961), was supplemented by an analyzer for slow secondary ions (Fig. 1). Measurements were made with primary particle energies of 3 - 30 kev. The ion production cross section was determined from the relative line intensity. In general, the overall error did not exceed 15%. It was

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found that, as a rule, σ_{0k} increases with the charge and the energy of the primary particles. In atom-atom collisions, only pure ionization is responsible for the production of slow ions. With rising charge of the primary particles, ionization is more and more governed by the contribution of resonance charge exchange and of ionization with capture. The last item is evaluated for collisions between atoms and singly-charged ions. Professor V. M. Dukel'skiy is thanked for a discussion. There are 8 figures, 1 table, and 9 Soviet references.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physicotechnical Institute of the Academy of Sciences USSR)

SUBMITTED: May 29, 1961

Fig. 1. Ion analyzer. Legend: ФС - focusing system, Т - slow ions produced by a fast atom or ion beam passing through gas, С - capacitor, О - grid window, К - metal casing, КС - collision chamber, Щ$_1$ - stop,

26698
S/056/61/041/005/013/038
B109/B102

26,2340

AUTHORS: Flaks, I. P., Ogurtsov, G. N., Fedorenko, N. V.

TITLE: Ionization by collision between Ne^{n+} and Xe and between Xe^{n+} and Ne atoms (n = 0, 1, 2, 3, 4)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1438 - 1442

TEXT: In order to clarify the effect of the charge of ionized atoms upon the production of free electrons, the authors measured the total ionization cross section σ_- (accuracy 15%) for single collisions between fast charged and neutral atoms. A method described by N. V. Fedorenko, I. P. Flaks, and L. G. Filippenko (ZhETF, 38, 719, 1960) has been used. The accelerating voltage ranged from 3 to 30 kv. Results of the measurements: The total ionization cross section σ_- of Xe atoms as a function of the Ne^{n+} velocity v is shown in Fig. 1. Fig. 2 renders σ_- of Ne atoms as a function of the Xe^{n+} velocity v. It was found that σ_- increased for

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Ionization by collision...

Ne^{n+} - Xe and decreased for Xe^{n+} - Ne with increasing fast-particle charge n. The results are interpreted as follows: The increase of σ_- with rising charge of the fast particles is due to the possible exothermic ionization processes involving capture. In Ne^{n+} - Xe collisions, the ionization process of Xe predominates over the stripping process of Ne^{n+} which requires a considerably higher energy. The stripping process can add to a decent contribution only in Ne^{0} - Xe collisions. The dependence is the opposite when ionization with capture is an endothermal process and when the main contribution to σ_- is due to stripping of fast atomic particles. Professor V. M. Dukel'skiy is thanked for discussions.
O. B. Firsov (ZhETF, 36, 1517, 1959) is mentioned. There are 2 figures and 8 Soviet references.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut (Leningrad Physicotechnical Institute)

SUBMITTED: June 9, 1961

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3554
S/056/62/042/003/004/049
B117/B112

24.6712, 26.2312

AUTHORS: Solov'yev, Ye. S., Il'in, R. N., Oparin, V. A., Fedorenko, N. V.

TITLE: Ionization of gases by fast hydrogen atoms and protons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 3, 1962, 659 - 668

TEXT: The ionization of H_2, N_2, He, Ne, Ar, and Kr by fast hydrogen atoms and protons of 10 - 180 kev was studied, and the ionization cross section, the stripping cross section for fast hydrogen atoms, and the production cross section for slow ions with various e/m ratios were systematically measured to obtain information on the ionization of inert gases and nitrogen. The measurements were made by the well-known condenser method which was supplemented by the mass analysis of the composition of slow ions. The experiments were carried out with a previously described device (Ref. 19: N. V. Fedorenko, V. V. Afrosimov, D. M. Kaminker, ZhTF, 26, 1929, 1956; Ref. 20: N. V. Fedorenko, V. V. Afrosimov, ZhTF, 26, 1941, 1956; Ref. 21: V. V. Afrosimov, R. N. Il'in, V. A. Oparin, Ye. S. Solov'yev,

Card 1/4

Ionization of gases by fast...

N. V. Fedorenko, ZhETF, 41, 1048, 1961). Accidental errors did not exceed ± 15%, except the cross sections σ_{H^+} and $\sigma_{N^{2+}}$ (± 30%). Theoretical and experimental data were comparable only to a limited extent. The stripping cross sections calculated in the Born approximation showed satisfactory agreement for energies above 60 kev. When the energies were lowered, the divergence between the relevant experimental and theoretical curves increased. Analysis of the experimentally obtained ionization cross sections proved the applicability of the Born approximation for the range of high velocities $v > v_0$. For the range of low velocities $v < v_0$, however, it could not be applied any more, since the cross sections for ionization by fast atoms were always a little greater than those for ionization by protons. In addition, the cross sections for ionization processes of the same kind increased with increasing target atom Z. The stripping curves of the fast atom (cross section σ_1) and the curves of the production of singly charged ions of inert gases (cross section σ_{01}) have shown that in most cases they reach maxima at velocities $v \geq v_0$. The peaks observed at

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Ionization of gases by fast...

lower velocities are qualitatively interpreted by a quasimolecular model, in which, owing to the drop of ionization potential, the peaks of the ionization cross sections are shifted toward lower velocities $v<v_0$, and where the ionization cross sections are interrelated by $\sigma(H)/\sigma(H^+)>1$. From the point of view of the quasimolecular model, the proton-atom system of the inert gas seems more stable with regard to ionization than the H-atom-atom system of the inert gas. The probability that a particle will be ionized after the decay of the quasimolecule depends on the electron binding in the atom in question and on the ratio of statistical weights of possible states of charge. These two factors may effect a "competition" between the ionization processes, which must influence the position of the peaks of the ionization cross section. The curves for the production of singly charged ions of inert gases and for the stripping of the hydrogen atom confirmed the assumption that the position of the peaks depends not only on the ionization potential of the relevant atom but also on other factors. The maxima for velocities $v\sim(1 - 1.5)v_0$ were determined for cross sections $\sigma_i(H)$ and $\sigma_i(H^+)$ of ionization by atoms and protons, respectively. The experimentally obtained position of the peaks on the

Ionization of gases by fast...

curves of cross sections for production of slow argon and krypton atoms is also given. It is noted that, as in the case of krypton, the peaks on the curves for two-electron and three-electron ionization ($\sigma_{02}(v)$, $\sigma_{03}(v)$) of argon correspond to about the same velocity $v_{max} \sim v$. As in the case of interatomic collision, the position of the peaks is presumably determined by the ratio of the internal electron velocity of the second particle to the velocity of the relative motion. V. M. Dukel'skiy and O. B. Firsov are thanked for valuable hints. There are 7 figures and 23 references: 10 Soviet and 13 non-Soviet. The four most recent references to English-language publications read as follows: R. Curran, T. M. Donahue, Phys. Rev., 118, 1233, 1960;. J. W. Hooper, E. M. McDaniel, D. W. Martin, D. S. Harmer, Phys. Rev., 121, 1123, 1961; J. W. Hooper, E. M. McDaniel, D. W. Martin, D. S. Harmer, Abstr. of the II Intern. Conf. Electronic and Atomic Collisions, Boulder, USA, 1961, p. 61 - 80; H. B. Gilbody, J. B. Hasted. Proc. Roy. Soc., A240, 382, 1957.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physicotechnical Institute of the Academy of Sciences USSR)

SUBMITTED: July 21, 1961

Card 4/4

FEDORENKO, N. V., AFROSIMOV, V. V., GORDEYEV, Yu, S., PANOV, M. N.,

"Characteristic Energy Losses in Single Collisions of Atomic Particles"

report presented at the 3rd Intl Conf. on Physics of Electronics and Atomic Collisions, London, 22-26 Jul 63

SOLOV'YEV, Ye. S.; IL'IN, R. N.; OPARIN, V. A.; FEDORENKO, N. V.

Ionization of Gases by Fast Helium Atoms and Singly-Charged Helium Ions

report presented at the 14th Meeting of the Intl. Committee for Electrochemical Thermodynamics and Kinetics (CITKE) Moscow, 19-25 Aug 1963.

Ioffe Physico-Tech Inst. Acad. Sci. USSR, Leningrad USSR

SOLOV'YEV, YE.S., IL'IN, R.N., OPARIN, V.A., FEDORENKO, N.V.

"Ionization of gases by helium ions and fast helium atoms."

Report submitted to the Third Intl. Conf. on the Physics of Electronics and atomic Collisions, London, England 22-26 July 1963

FEDORENKO, N.V.

Sixth Conference on the Analysis of Platinum Metals. Zhur.anal.khim. 18 no.10:1279-1280 O '63. (MIRA 16:12)

Fedorenko, N. V.

10

ACCESSION NR: AP3004484 S/0048/63/027/008/0994/0995

AUTHOR: Sena, L. A.

TITLE: Second All-Union Conference on the Physics of Electron and Atom Collisions [Uzhgorod, 2—9 October 1962]

SOURCE: AN SSSR. Izvestiya, ser. fiz., v. 27, no. 8, 1963, 994-995

TOPIC TAGS: conference, electron collision, atom collision, collision physics

ABSTRACT: The II Vsesoyuznaya konferentsiya po fizike elektronny*kh i atomny*kh stolknoveniy (Second All-Union Conference on the Physics of Electron and Atoms Collisions), was held in Uzhgorod, 2—9 October 1962. The following reports were presented: "Theory of the charge-exchange process during atomic collisions," by Yu. N. Demkov; "Charge-exchange of multicharge ions," by I. P. Flaks; "Ionization due to atomic collisions," by N. V. Fedorenko; "Excitation of atoms and molecules due to electronic collisions," by I. P. Zapesochny*y; "Charge exchange and ionization during atomic collisions in the high-energy range," by V. S. Nikolayev; "Photoionization of gases and vapors by vacuum ultraviolet radiation," by Academician A. N. Terenin and F. I. Vilesov; "Effective cross sections of atomic collisions important in the theory of gaseous quantum generators," by I. I. Gobel'man; "Dissociation of molecules and ions during collisions of fast particles," by N. N. Tunitskiy; and "Corpuscular diagnostic of plasma," by V. V. Afrosimov.

ASSOCIATION: none

SOLOV'YEV, Ye.S.; IL'IN, R.N.; OPARIN, V.A.; FEDORENKO, N.V.

Ionization of gases by fast atom and singly charged helium ions. Zhur. eksp. i teor. fiz. 45 no.3:496-502 S '63. (MIRA 16:10)

1. Fiziko-tekhnicheskiy institut imeni A.F. Ioffe AN SSSR.
(Ionization of gases) (Helium)

FEDORENKO, N.V. (Chelyabinsk); KOLESNIKOV, F.F. (Chelyabinsk); [illegible], A.M. (Chelyabinsk); MOROZOV, A.N. (Chelyabinsk)

Magnetic treatment of chromite ores with preliminary roasting. Izv. AN SSSR Met. i gor. dela no.3:182-188 My-Je '61. (MIRA 14:7)

FEDORENKO, N.V., doktor fiz.-matem.nauk

London Conference on the Physics of electron - atom collisions. Vest. AN SSSR 34 no. 1:48-51 Ja '64.
(MIRA 17:5)

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